McVITIE & PRICE'S OATCAKES.

THE PRACTICAL TEACHER

WELL-KNOWN TEACHERS AT WORK: MR. T. H. JONES.

CONTENTS
OF THE
AUGUST NUMBER.

WELL-KNOWN TEACHERS AT WORK .. 55
TALKS WITH TEACHERS ON PSYCHOLOGY. By J. Guns, M.A., D.Sc. .. 58
RECREATIVE BOTANICAL PAPERS .. 60
MAGNETISM AND ELECTRICITY .. 62
OBJECT LESSONS IN HISTORY .. 65
THE ELEMENTS OF SCHOOL HYGIENE. By Arthur Newsholme, M.D., F.R.C.P. .. 66
EDUCATION IN ENGLAND. N.U.T. Notes, etc. By T. B. Ellery, F.R.G.S. .. 69
TECHNICAL AND SECONDARY EDUCATION .. 70
EDUCATION IN SCOTLAND. E.I.S. Notes, etc. By James Paterson .. 71
NOTES FROM THE NORTH .. 72
FOREIGN NOTES .. 73
NOTES OF A LESSON ON THE DOG. By W. Done, B.A. .. 74
THE INSPECTOR'S NOTEBOOK .. 75
NOTES OF TWO LESSONS ON THE FLOW OF A STREAM. By W. Done, B.A. .. 76
BLACKBOARD DRAWING .. 78
BOTANICAL NOTES FOR TEACHERS .. 81
OUR ILLUSTRATED GEOGRAPHICAL NOTEBOOK .. 82
PRACTICAL ELEMENTARY SCIENCE .. 83
ELEMENTARY LESSONS IN THE PRINCIPLES OF GRAMMAR 84
AN INFANT-SCHOOL "AT HOME" .. 86
CLAY MODELLING .. 86
THE CORRELATION OF SUBJECTS IN AN INFANT SCHOOL 88
MENTAL ARITHMETIC FOR INFANTS .. 88
NEW VARIED OCCUPATIONS .. 89
QUEEN'S SCHOLARSHIP EXAMINATION, 1901 .. 90
OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE. By A. T. Flux .. 93
OUR CERTIFICATE COURSE FOR 1901. By G. Collar, B.Sc. 98
LONDON MATRICULATION. By R. C. B. Kerin, B.A. .. 101
QUERY COLUMN .. 103
STAR STUDY FOR SCHOLARSHIP STUDENTS .. 104
CHEMISTRY NOTES .. 105
NOTES ON ADVANCED AND HONOURS PHYSIOGRAPHY .. 106
REPLIES TO SCIENCE QUERIES .. 106
THE SCIENCE AND ART DIRECTORY FOR 1900 .. 107
OUR FRENCH PRIZE COMPETITION .. 108
THE EDITOR'S TABLE .. 109

VOL. XXI No. 2

EDITORIAL, PUBLISHING AND ADVERTISING OFFICES OF "THE PRACTICAL TEACHER"
35 & 36 PATERNOSTER ROW, LONDON, E.C.
NEW YORK OFFICE, 37 EAST EIGHTEENTH STREET.

PRICE 6D.

FRY'S PURE CONCENTRATED COCOA.

JUST READY. PRICE TWOPENCE.

. . The . .

Practical Teacher's ART MONTHLY.

FULLY ILLUSTRATED CONTENTS OF AUGUST NUMBER:—

LEAVES FROM MY SKETCHBOOK.

FAMILIAR BIRDS: The Nightingale.

WELL-KNOWN PICTURE: Mrs. Siddons (*Gainsborough*). By W. E. Sparkes.

DAILY ROUNDS OF A DRAWING INSPECTOR.

MODELLING IN CLAY. By the late T. Cannon. Arranged by J. H. Collingwood.

THE NEW SCIENCE AND ART DIRECTORY.

SYLLABUS FOR SCIENCE SCHOOLS.

SHIPPING FOR SCHOOLS.

WOODWORK FOR SMALL SCHOOLS. By J. Spittle.

EXHIBITION OF DRAWING AT BRISTOL.

HANDWORK ASSOCIATION OF SCOTLAND.

BOARD OF EXAMINATION FOR EDUCATIONAL HANDWORK.

NATIONAL ASSOCIATION OF MANUAL TRAINING TEACHERS.

EDITORIAL NOTES AND REVIEWS.

Order from your Bookseller now.

Annual Subscription for One Year, by post, 2s. 6d., direct from

THE PRACTICAL TEACHER OFFICE,
35 and 36 Paternoster Row, LONDON, E.C.

AYRES' CERTIFICATE AND SCHOLARSHIP CLASSES.

ORAL CLASSES

MEET AT THE

Ward Schools, 181 Aldersgate Street and 16 Bridgwater Square, E.C.

SCHOLARSHIP CLASS.

New Term begins on March 31.

BEST OBTAINABLE PREPARATION GUARANTEED.

CORRESPONDENCE CLASSES.

Special Points in connection with the Class:—

1. Work is regularly sent and promptly returned.
2. Solutions are given to all Arithmetic, Algebra, Parsing, and Analysis, with full Explanatory Notes.
3. Model Answers are sent weekly to all typical Questions, Essays, etc.
4. Special Courses of Papers in all subjects are given.
5. The Course of Papers includes all the most recent Questions.
6. The Fee is strictly inclusive.

New Term begins March 30.

CERTIFICATE CLASS, 1901.

Preliminary Class will begin in April.

(Names can now be entered.)

Intending Students should join as soon as possible.

KINDERGARTEN CORRESPONDENCE CLASS.

For Prospectus, References, Testimonials, etc., apply to

Mr. H. B. AYRES,
4 ARUNDEL SQUARE, BARNSBURY, LONDON, N.

THE PRACTICAL TEACHER

A MONTHLY MAGAZINE AND REVIEW FOR THE SCHOOL-ROOM AND THE STUDY

Vol. XXI. No. 2. AUGUST, 1900. Price 6d.

NOTICES TO CORRESPONDENTS AND SUBSCRIBERS.

☞ ***Subscribers who do not receive the SUPPLEMENT presented with this Number are asked to promptly communicate with us, and to send at the same time name and address of Bookseller or Newsagent through whom the Magazine is obtained.***

All literary communications should be addressed :—

Office of "THE PRACTICAL TEACHER,"
35 and 36 Paternoster Row, LONDON, E.C.

"THE PRACTICAL TEACHER" may be ordered of any Newsagent, Bookseller, or at any Bookstall in the United Kingdom.

Subscribers wishing to have the Journal posted regularly to them from this Office can subscribe upon the following terms :—

	One Year.	*Half Year.*
United Kingdom, Continent, Colonies, and United States	7/-	4/-

REMITTANCES, POST-OFFICE ORDERS, CHEQUES, etc., should be made payable to HENRY SCHEURMIER.

Rates for Advertisements upon application.

"THE PRACTICAL TEACHER" may be ordered through all Colonial Booksellers and Newsagents. Monthly supplies are regularly sent to the chief towns in Australasia, South Africa, and India. Copies can also be obtained at our

NEW YORK OFFICE: 37 East 18th Street;

AND AT

PARIS: Neal's Library, 248 Rue de Rivoli;

BERLIN: Gsellusische Buchhandlung, Mohren Strasse.

WELL-KNOWN TEACHERS AT WORK.

MR. T. H. JONES.

HEAD-MASTER, DUNCOMBE ROAD HIGHER-GRADE BOARD SCHOOL, HOLLOWAY, LONDON, N.

OF the many services rendered to the teacher by the Teachers' Union, the greatest undoubtedly is that of standing between him and the misery attendant upon undeserved capricious dismissal. The tragedies that found expression in the president's address at York would be increased tenfold were it not for the judicious action of the Tenure Committee of the N.U.T. ; and it was to see the presiding genius of this committee at home in his own school that we found ourselves at Duncombe Road on a certain Friday forenoon in June. Let us at once hasten to say that we found Mr. Jones the schoolmaster just as admirable as Mr. Jones the chairman of the Tenure Committee. Judged from any standpoint, Duncombe Road is a highly efficient and an exceedingly interesting school.

Attendance.—To begin with, the attendance of the boys—some 460 in number—averages from 92 to 93 per cent. ; the means adopted to achieve this end being (1) emulation between the various classes, and (2) the attractiveness of the Friday afternoon's lessons, which include object and science lessons, made acceptable by telling experiments. This is Mr. Jones's explanation, but we would add, as a third and chief reason, the feeling of the boys that school is a delectable place, where are to be found pleasant friends in the persons of the class masters, who are in close sympathy with Mr. Jones in treating the boys with sweet reasonableness.

The Attainments.—Immediately upon entering the roomy hall, one is face to face with the "honours board," whereon are inscribed the names of the boys who have done honour to themselves and to their school in winning scholarships. It was very evident that Duncombe Road will soon need another honours board, for the present one is now nearly full. This is but one of many proofs of the success of the school, which has only reached its present condition after much hard work and skilful contriving on the part of head and class masters, whose objective has been the development of the upper standards. In 1889, Standards VI., VII., and Ex-VII. worked together as one class, to the disgust of the Ex-VII. scholars, who naturally responded to the marking time inseparable from such a classification by leaving. This did not strike Mr. Jones as the right way to bring out the highest possibilities of his promising lads, so, gradually extending the curriculum by the inclusion of shorthand and book-keeping, he increased the number of scholars in this class sufficiently to justify the appointment of another teacher, whereby Standard VI. was separated from Standards VII. and Ex-VII., since which time such progress has been made as to bring physiography, hygiene, elementary physics and chemistry—all in connection with South Kensington—within the curriculum ; and lately the teaching of French—on conversational lines, of course—has been undertaken. The result has been a further gratifying increase in the number of boys staying on for an Ex-Standard VII. course, so that to-day this part of the school constitutes a separate class, and since July 1899 the school has been recognised by the London School Board as a higher-grade school. Those who have had to go through the work of building up a secondary top to their elementary schools will appreciate the work thus done by Mr. Jones and his staff in converting parents and children to the belief that it is worth while to sacrifice the possible earnings of the lad of thirteen or fourteen in order

OUR PHOTOGRAPHIC COMPETITION FOR THE HOLIDAYS.
See page xiii.

that the much better trained youth of fifteen or sixteen may be the school product. They will also agree with Mr. Jones that higher-grade schools have a direct influence in extending

MR. T. H. JONES, HEAD-MASTER.

the school life of young England, and that they have justified the primary teacher in claiming to have some part and lot in the secondary education of the country.

The Staff.—If Mr. Jones had his way, this notice would say, "See what my colleagues have done for my school!" whereas, if one turned to the staff, the verdict would be, "Behold the work of our admirable and amiable chief!" And one is constrained to admit that both verdicts are just; for the staff is worthy of the chief, as we saw in going round the school, where we admired, amongst many other things, the marking system of Mr. Smith, and the courteous deportment of the upper lads under the charge of Mr. Matthews. We were particularly struck with one feature of the work—namely, the designing of patterns for wall-papers, some admirable specimens of which we saw. After having drawn the design once, it is, of course, necessary to try the effect thereof in a "repeat." This is done by carefully cutting away the lines so that the drawing may become a stencil wherewith any number of "repeats" may be obtained. The result was so successful that we feel sure many of our readers will like to take the hint and follow this practice of getting repeated designs in any desired colour.

The results obtained in physiography deserve to be placed on record. Since 1895, when the boys were first sent in for the Science and Art Department's examination in the subject, ten have passed in the advanced stage, four of whom were in the first class, and a hundred have passed in the elementary stage. There has not been a single failure.

The Building.—In addition to the ordinary roomy classrooms, one of which is fitted up with a demonstration table, there is a very good art room, over which presides an art master who has exhibited at the Royal Academy, and who is responsible for the design and stencil cutting to which reference has been made. In addition, Duncombe Road is a manual training and also a laundry centre, the workshop and laundry being detached from the main building, both being under the charge of able and enthusiastic specialists in those two departments of industrial school work.

Career of Mr. Jones: (1) As Teacher.—Born in the Welsh part of Pembrokeshire, the subject of our sketch attended the rural Board School at Penfford, in which school he began his apprenticeship, and so obtained, first hand, acquaintance with the rural and bilingual difficulties with which so many teachers have to contend. On the death of his master he was transferred to another rural school at Llysyfrân, three miles distant from Penfford. The removal of his master led to another transfer, this time to an urban Board School at Narberth, which school he left for the Normal College, Bangor, where he was trained in 1876–77. Upon leaving college he entered the service of the London School Board as assistant master at the Poole's Park School, then in the charge of Mr. Heasman, whom every Finsbury teacher, in common with Mr. Jones, knows only to respect. Mr. Jones acknowledges with pleasure that he owes much to the high educational ideals, the sound methods, and the kindly encouragement that were, and are, characteristic of this Finsbury stalwart. After four years' work as assistant, Mr. Jones was promoted to the head-mastership of the St. John's Road temporary school, whence, three months later, he removed to the Whittington School on Highgate Hill, a post he retained for four years, when he succeeded Mr. Heasman—who had meanwhile been promoted to Montem Street—as head-master of Poole Park School. It is interesting to note that Mr. Tutt, the treasurer of Finsbury, and a man after Mr. Jones's own heart, was appointed to the Whittington School, where he has won golden opinions from all sorts and conditions of people.

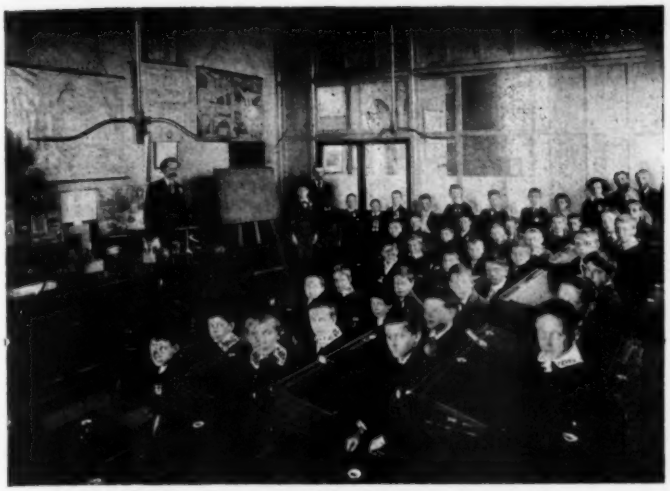
In 1889 Duncombe Road fell vacant in consequence of the death of Mr. Trayes, and Mr. Jones was appointed to the post. Three years after his appointment, the school, originally of the third grade, became a fourth grade school, in virtue of increased attendance necessitating enlarged accommodation.

(2) As Union Worker.—We have shown that Mr. Jones—like all prominent unionists—is eminently successful with the chalk and duster. It remains to show that his success as teacher-champion is no less pronounced. He has been a member of the N.U.T. for eighteen years, for sixteen of which he has sat on the Finsbury Council. He it was that originated the Finsbury card scheme, whereby an income of £250 per annum is obtained for the charitable funds. For six consecutive years he has been a member of the Executive, where he is held in high esteem, having been chosen chairman of the Law Committee in 1897, of the Law and Tenure Committees in 1898, and of the Tenure Committee since its inception.

On more than one occasion the chairman has left school on Friday for the station, travelled all night, spent the whole of Saturday in investigating, and caught the train.

MR. T. H. JONES AND STAFF.

BRITISH MUSEUM



A SCIENCE LESSON.

back to London on the Saturday night, arriving home in the early hours of Sunday morning, never having had his clothes off since the preceding Thursday. To this devotedness Mr. Jones adds consummate tact in managing the managers and School Board members in such wise as to awaken within them a due sense of justice which compels them, not infrequently, to withdraw the undeserved notice of dismissal, and to send Mr. Jones on his way rejoicing almost as much as the teacher whom he has thus relieved of his load of dread. Small wonder is it that Mr. Jones takes pride in the bundle of letters which he has received from grateful teachers, of which the following is a fair sample:—"On behalf of my wife, my family, and myself, I thank you most heartily for the admirable manner in which you worked up the case. Even my opponents give you credit for the perfectly impartial way in which you sifted the evidence *pro* and *con*."

"As chairman of the Tenure Committee of the Union," says ex-President Waddington, "the most important of the many committees of the N.U.T., Mr. Jones has done service that gets too little requital because of necessity it must be confidential. Some day soon the Union will honour one of its most loyal and capable leaders by electing Mr. Jones to the presidential chair."

This is exactly the opinion of the Finsbury Association, which has unanimously and enthusiastically nominated him for the vice-presidency in 1901, when it is hoped that the N.U.T. will honour itself by electing Mr. Jones.

A prophet is often without honour in his own country. Not so Mr. Jones. He is at the present time president of the Metropolitan Board Teachers' Association, which has a membership of eight thousand. In seconding the vote of thanks offered to Mr. Jones at the annual meeting of the M.B.T.A. in October last, Mr. Albert Smith, a member of Mr. Jones's staff, made known the fact that an address of congratulation, inscribed on vellum and suitably framed, had been presented by the staff of Duncombe Road to Mr. Jones. The address reads as follows:—

"*To Thomas H. Jones, Esq., Head-Master,*
"Duncombe Road Higher-Grade School.

"DEAR MR. JONES,—It has occurred to us that we could find no more fitting occasion on which to express the very high regard we have for you as the head-master under whom we serve, than your election to the presidency of the Metropolitan Board Teachers' Association; and as the class masters of your own school, we desire to offer you our most hearty congratulations upon attaining that honour—an honour which we feel is reflected upon ourselves and upon the school.

"For ten years you have been at the head of this school, and we are anxious to place on record our admiration of the singleness of purpose and loftiness of ideal which throughout have marked your conduct of the school. To make character the chief object of the education given within its walls has been your aim, and no one knows so well as we how successfully that has been achieved.

"But it is naturally your personal relations with ourselves which more closely concern us now, and we hasten to assure you that we most highly appreciate the kindly sympathy, brotherly consideration, and active assistance we have always received from you. Our professional lines have indeed been laid in pleasant places, and it is because we believe you will value this tangible expression of our feelings towards you that we ask you to accept this address at our hands.

"In conclusion, may we express our earnest and sincere wishes for your continuance in health, happiness, and prosperity, and voice the hope that the year of office upon which you are just entering will be distinguished as one of the brightest in your life?—We are, dear Mr. Jones, yours very faithfully,

"A. H. SLADE.	H. T. MASON.
"A. R. GORDON.	C. W. HOUSE.
"G. MATTHEWS.	ALBERT SMITH.
"G. E. TRINNAMAN.	A. H. NOEL.
"R. A. MASTERS.	THOS. HARVEY."

MANUAL TRAINING.

It is the hope of Mr. Jones's friends throughout the country (amongst whom the writer is proud to be included) that it may be their privilege next Easter to congratulate the quiet, tactful, enthusiastic teacher and the zealous, unobtrusive tenure worker on his election to the vice-presidential chair of the N.U.T., which he is so well qualified to ornament.

"Studies of Shipping for Schools,"

With many specially-prepared Illustrations, appears in the August number of

THE PRACTICAL TEACHER'S ART MONTHLY.

Price Twopence.

The Practical Teacher Office, 35 and 36 Paternoster Row, London, E.C.

TALKS WITH TEACHERS ON PSYCHOLOGY.

I.—THE PSYCHOLOGY OF FALSEHOOD IN CHILDREN.

BY JOHN GUNN, M.A., D.SC.

PART III.

MANY of our common proverbs are full of deep philosophical truth, and illustrate the most important problems of ethics and of psychology. That "the wish is father to the thought" is apt to illustrate itself both in morals and in psychology. This proverb states in popular language the fact that belief does not always rest on evidence and reasoning. Those who are familiar with Mr. A. J. Balfour's work on *The Foundations of Belief* will at once remember how wide is the application of this truth: we might even call this a *truism*, but for the fact that there are still some people who insist that they believe nothing which is not proved.

We refuse to believe in the baseness of one whom we have long known (as we think) and loved and trusted. Evidence which any criminal judge would bow to is swept aside; we know it must be maliciously or accidentally false. The general principle that it is human to err, we may admit in the abstract, but we refuse to take this as a case in point. And, after all, what a noble thing is this loyalty of our loved ones, this affection which blinds them to our errors, and makes it impossible for them to visit even our confessed faults with the moral disapprobation which they warrant! This kind of belief is certainly different from the judgments which are based on reasoning. It is different: shall we call it lower or higher? Perhaps the truth is not all on one side. Shall we regard the sun as the type of perfect brightness, or as an area for the display of sun-spots?

But the proverb quoted, "The *wish* is father to the thought," is usually an expression of reproach. There is a point at which beliefs begotten of desire are obviously erroneous. Where is the limit? Somewhere in the middle, as Aristotle would remind us; a limit not fixed in the nature of things, but where the man of prudence and experience would determine. We have to deal here with cases which plainly transgress this limit—beliefs which are notoriously erroneous, and which may even mark a disordered mind.

A mother who awaits the home-coming of her sailor-boy, and who receives instead the sudden tidings of his shipwreck, may experience a shock which prevents for ever any clear reasoning on this subject, while leaving her mind fairly clear on every other subject. She performs her daily tasks as usual, but her brain, we may say, is physically unable to receive any impression regarding her son save that he may return any day. This belief, originally reasonable, and ever strengthened by desire, now exists as a *fixed idea*. Any evidence which opposes it will be brushed aside impatiently, as irrelevant or impossible. This is a pathological example, belonging to the realm of disease; but the pathological processes of disease are only normal processes carried to excess. Such normal processes we may see, in excess as compared with the standards of adult life, when we study the workings of intelligence in the child.

I feel convinced that cases which look like deliberate falsehoods, invented to avoid reproof or displeasure, or perhaps to avoid punishment, are sometimes to be explained on this ground. There can be no doubt at all that many of the statements made in an exaggerated form, to gratify the vanity of the child who tells a story, are, on the same theory, easy of explanation, and that there is no intention to deceive. The wish is evidently father to the particular form which the thought has assumed; and so strongly does it operate, that what we should call the true aspect of the case would be to the child incredible. He feels that it is quite impossible he could have done what we believe he did: his account *must* be the correct one. He wishes that things had happened so in a particular way, and *presto, change!* the fact has to his mind actually been transformed through his wish.

A came up to his father one morning and asked for a chocolate from a store whose existence was known to him. "Have you finished your porridge?" was the reply. *A* knew that this was a necessary condition of his receiving the chocolate, and, with a confident smile, he answered "Yes." *B* entered at that moment, and, ignorant of what was passing, remarked, "*A*, you are to go and finish your porridge. You have left your plate on your chair." *A* looked puzzled, but not conscience-struck. "Oh, now I remember!" he cried; "I haven't quite finished," and ran off at once. Two minutes later he was back for his chocolate, saying, "*Now* I have finished!" By a cynical or even a careless observer *A* would be at once condemned as guilty of attempted deception. Yet it was abundantly clear that he was himself deceived before he deceived his father. The thought of the desired sweet moved him at once to the belief that he *must* have fulfilled all the conditions of receiving it. There was absolutely *no* feeling of shame, but only of surprise, on learning that he had not done so—and *A* is no stranger to the feeling of shame when he is conscious of transgression.

A had rather a talent for deceiving himself. He would bring something into the room, a book or a paper, which his father would then express a desire to look at. "Yes, I just brought it in for you to look at," he would reply; and his face would show great self-approbation at having done so meritorious an action. He was so pleased at the thought of having done something nice that he actually persuaded himself he did it on purpose. If he was asked point-blank whether he did not really bring it in to look at it himself, he would consider a moment, and sometimes reply, "Yes, but now you may have it. I don't want it." Again the little man was deceiving himself: he really did want it, but the pleasure of doing something for his father eclipsed the purpose he had of using the book or paper, and made that purpose actually non-existent for himself.

Many children—and many who are children no longer—have a special aptitude for saying what they think they are expected to say, rather than what may be more strictly true. This may easily develop into conscious perversion of the truth, but it may also exist in an unconscious form.

There are, I think, two distinct causes to which this tendency may be due—separately or conjointly. The first we may state as the desire to please. We all remember the faults which Topsy confessed to Miss Ophelia—not because she was guilty of them, but because she knew that she was expected to confess something. And we may have read the perhaps apocryphal story of the boy who was asked in stern tones by a reverend inspector, "Who made the world? Come, sir, tell me at once, who made the world?" "Please, sir, it was *me;* but I'll never do it again!" True to psychology, if not to fact. The tone suggested fault-finding, and that a frank confession alone would avoid censure and punishment; the meaning of the question was entirely lost sight of.

Falsehood arising from the desire to please, by saying what is expected, is more characteristic of some races than of others. Where politeness is carried far this inevitably follows. In the Celt more than in the Saxon, and in Eastern nations more than in Western, if we except possibly the Indian tribes of the Far West, we see this developed. It is regarded as better to be polite than to differ from the person who speaks.

But in children the influence of the desire to please comes in as a special case of our last point—the wish becomes father to the thought in reality, and what you seem to wish is not only said but believed. It gives an emotional colour and vividness to one side of an alternative rather than the other, and gives to that side, therefore, the vividness and force of reality.

But there is often another explanation of this kind of falsehood, and one which is much less understood and believed in: I refer to what is in hypnotism called *suggestion*. In the hypnotic state, as is well known, the subject is entirely at the mercy of the operator for what he thinks and

feels as well as for what he does. It may seem absurd to give this suggestion any place in such a study as the present, but I am fully convinced that it is a more important factor in mental study than has yet been recognised. Without arguing the case, I merely mention some things that are largely due to the working of suggestion, or the hidden influence of mind on mind direct—an influence of which the dominant mind is as unconscious as the other: I refer to such things as the convincing power of many speakers, especially in comfortable and well-lighted rooms, whose speeches when read are not above the average; the superior culture value of oral teaching as compared with private study; the remarkable influence, both moral and intellectual, of many teachers on their classes, who are not otherwise remarkable men; and, above all, the knack of managing young children and making them happy, seen in many parents and teachers and others—a power which certainly does not operate through reason or even through speech, as it may be exerted over children of only a few weeks or months old. There is an influence that we can only roughly describe by the term *magnetic*, strongly possessed by many, and to this influence children are more sensitive than grown-up people. We do not know much of the conditions under which this power acts, but that is no reason for ignoring its existence. And if its existence is indeed a fact, we must reckon with it in such a quest as the present. I do not say it is a power that makes for falsehood; for one common example of it is that influence exerted by a person which makes it impossible to tell him a lie. That is not an uncommon feeling about certain people. But in the case of a child to whom the conscious lie does not exist, the same dominating influence will tell in another form. It will tend to make the child think as the man in question thinks, and to say and believe what he expects. This question of suggestion is one regarding which I feel some hesitation about making definite statements. Yet it is one which is well worth study by all who are engaged in the work of education in any form, and which has as yet been little attended to.

Regarding the conscious play of the imagination—the child pretending what he knows to be a pretence—I need say little; it is always evident, often in grotesque forms. This is really due to the child experimenting with his ideas just as he does with his toys. He jumbles them together, turns them outside in, makes them stand on their head, and plays every conceivable trick with them; but, as a rule, he deceives neither himself nor others by his wayward play-fancies. Yet a peculiarly imaginative child may hit on a combination which pleases him so much that he dwells on the idea till it assumes the form of truth; and he may proceed to tell, as in a case which I remember, how he was riding down the road on an elephant, and what the elephant said to him, and so on. Some such picture, however impossible to his elders, first attracted him, and by-and-by assumed all the marks of an actual memory-image. This is probably the origin of most of those grotesque falsehoods, unconnected with any conceivable facts, which children sometimes bring out of their treasure-house, to the confusion of their elders.

I have all through this paper avowed my hesitation at falling back on the deliberate falsehood theory to explain the phenomena of children's falsehoods, and I shall give only one more reason for this hesitation. I regard a deliberate lie as a form of mental exercise which is quite beyond the power of most young children, even at an age when they may habitually wander far from truth.

Telling a lie as a deliberate action implies many mental processes. There is first a knowledge of what really happened—a mental memory-image of the truth. There is next the belief that the person listening is ignorant of the truth. Thirdly, there is a conscious motive for misrepresenting the event to this person. Fourthly, there must be present a mental idea-image of what is to be reported as the truth, and this in itself may be very complex: it may be the result of comparing several possible falsehoods, and selecting that which will most easily pass for true.

Now, however easy such a train of thought may be to the followers of Ananias in adult life, it seems somewhat of a task for a child of tender years. If force always follows the line of least resistance, we should much rather expect a child to say what seems to him to be truth. We say, what *seems to him* to be truth; for if the foregoing remarks have any validity at all, they have shown that the seeming truth may have suffered distortion from a great variety of causes.

The mere task of contemplating calmly two incompatible mental images and making choice between them, is a difficult one for a child. This was first revealed to me by observing the difficulty of getting a young child—say of three years—to conceive of a simple alternative. "Will you buy this *or* that with your penny?" is often too hard a mental problem, if both things are desirable. The choice is not the one or the other, but *both*. So with memory. "Was the person you saw *A* or *B*?" is too hard. "Was it *A*?" "Yes."—"But was it not *B*?" "Oh yes."—"But it could not be both; which was it?" "I don't know." Observe here suggestion at work, leading the child to affirm first *A* and then *B*, as each was mentioned to him, and then the two suggested mental images, *A* and *B*, actually confusing the original memory-image. Nor does this argue a weak power of memory; it actually coexists with a very tenacious memory. But a child's memory works by clues that are often beyond our observation. Some accidental remark next recalls a point of dress or appearance of the person who had been seen, and immediately the child gives a minute description of the individual, and easily recalls his name—say *B*. You then remind him, "But you said it was *A*." The child is intensely amused at his blunder, and remarks, "Wasn't I silly to tell you it was *A*!"

We have no space left for the full discussion of conscious and deliberate falsehood—for no one can doubt that this phase is actually reached sooner or later in many children. We should not be far wrong, probably, if we put the time of its probable appearance somewhere about the beginning of the period of boyhood rather than childhood. When it does occur, the moral repugnance of teacher or parent should not prevent his making a careful study of its causes. Original sin is too vague as a cause, and the unsparing use of the rod too easy as a cure. We have seen that falsehood is a natural refuge of the weak against the strong, and therefore whatever makes the elder appear in the light of an enemy is sure to foster deception in the younger. If a boy tells a lie to avoid punishment for a fault, be sure that he is doing what we all do every day—choosing what seems the less of two evils. And he will continue to do so until he realises that the habit of lying is a greater evil than the suffering of punishment. This is not an easy lesson to learn. For the boy who dreads punishment with a nervous terror it may be an extremely hard lesson indeed.

When a boy deceives his teacher, in word or by silence, in order to screen a companion, the case is harder still. He is face to face with one of those moral problems which make life so much of a puzzle; and I am not at all sure that we should add to the moral strength of the boy by insisting that speaking the truth is in every such case an absolute duty.

Life would be a very simple matter indeed if the choice always lay between right and wrong, and if conscience were the infallible guide to conduct that our ethical theories sometimes make it. We are always clear as to the rightness of doing our duty; the puzzle is to know in a given case what our duty is, or which of two duties, incompatible with one another, is to be chosen. If the moral instinct of a boy leads him to choose differently from what a man would have done, this does not argue that what the boy has done is wrong. There is need for tolerance here. Allowance must be made for all the difference of perspective of things according as we take the higher and the lower points of view. This is difficult; but the teacher's success will depend much on his power of seeing things as his boys see them, and also on his power of making them feel that he tries to do so. Falsehood is always for the *enemy*, truth for the *friend*. To betray the friend is worse than to deceive the teacher, who is less a friend than the companion. Had the teacher been *more* a friend than the other, he would not have been deceived. It will not always do to assume that his official position makes deceiving him a special crime. Boys are very unconventional in such matters. For the teacher to take his stand on Mount Sinai and hurl the tables of stone at the offender is simple,

perhaps, but not effectual, and may lead his boys to doubt whether he is any more successful in his duty than they are in theirs.

Here, however, we begin to touch upon the moral side of falsehood, and that, however important and interesting, especially for teachers, is beyond the scope of this paper. Our object has been merely to investigate some of the psychological aspects of falsehood in young children in the pre-moral period. Whatever didactic value such an inquiry may possess is chiefly indirect, and seems to point in the direction of tolerance and patience towards the growing intellect.

RECREATIVE BOTANICAL PAPERS.

THE DAISY.

MOST animals are gregarious; at any rate, those with higher intelligence seem to delight in the fellowship of their kind, and unite for mutual defence and help. Man is eminently a social animal, and one of the greatest punishments meted out to him for wrongdoing is solitary confinement. He has recognised the necessity of combination, co-operation, and division of labour, and we thus find in these days trades unions, co-operative societies, clubs, socialists, etc. The time is past now when the teacher leaves his teaching to make his own axe for chopping his wood, to mend his shoes or his coat, to sow corn for his flour, or to do the work of any of the "trades." He leaves these to the cutler, bootmaker, tailor, farmer, etc. By giving his whole time to teaching he becomes an expert, and able to give a better education to the children of other workers than their own parents could give. The teacher also is the gainer; for the cutler can make him a much better axe or knife, the shoemaker better boots, and the tailor a better-fitting coat. Co-operation and division of labour are beneficial to all concerned.

There are many beautiful theories involving the sinking of self for the good of the community, but as society is at present constituted, it seems that the theories are far from being realised. We should hardly expect to find an example

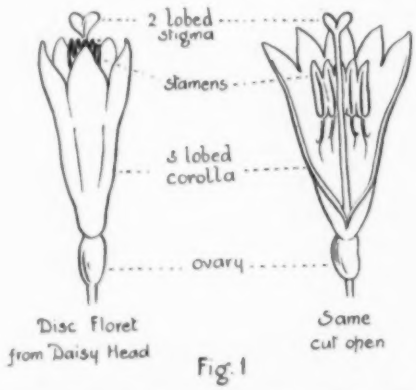


Fig. 1

of the total sinking of the individual for the general good among the flowers; yet such is the case. Some may have been wondering what the preceding has to do with the title. Well, it is like the usual first head in a Notes of Lesson—the introduction. If by the foregoing well-known and simple illustrations I can show the general reader the high state to

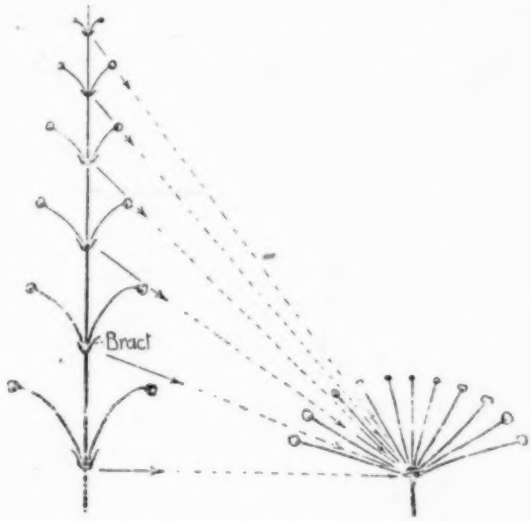


Fig 2 Fig. 3

which social evolution has been carried in the daisy, it will have served its purpose.

The daisy is popularly regarded as a single flower; but if examined more closely, it will soon be seen that this is not the case. Examine any ordinary flower—for example, a buttercup. Each flower is found to consist of four parts: (1) an outer part, generally coloured green, and called the calyx—this is for protecting the inner parts of the flower; (2) the

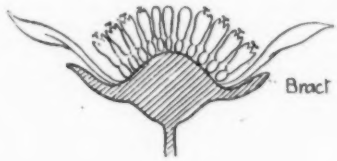


Fig. 4.

corolla or coloured portion, for attracting insects and protecting the two inner portions; (3) the stamens, bearing the yellow dust called pollen; (4) the pistil, in the centre, where the future seeds are to be found.

Now if a daisy head is examined, it will be found to consist of a great number of small parts. Choose a large marguerite or ox-eye daisy, and pick out one of the parts forming the yellow eye. It will be found to be like Fig. 1, and consists of corolla, stamens, and pistils: the calyx would not be noticeable. Every little portion forming the eye is similar, and it will thus be seen that the eye is not a simple flower, but a group of small flowers. The question now arises, Why should they grow clustered together like this? It is probable that the remote ancestors of the daisy family grew, each little flower on its own flower stalk, separated from its neighbours, like Fig 2.

The first step towards the formation of the flower head would be the suppression of the internodes—that is, the parts of the main stalk between the lateral shoots. This would bring all the small flowers nearer together, like Fig. 3. If *small* flowers grew separately, they would be likely to escape the notice of bees and insects, just as particles of dust on the school floor are not conspicuous until they are swept together, when they can be more distinctly seen. It is well known what a wonderful part insects play in the fertilisation of flowers, and how advantageous it is for flowers to be cross

fertilised. Small flowers growing alone would be at a serious disadvantage in the severe struggle for existence, but to overcome this we find that small flowers nearly always grow together in clusters, producing an inflorescence which is very conspicuous. Clover, meadow-sweet (spiræa), bedstraw, forget-me-not, lily of the valley, are familiar examples of this.

It is evident that the flowers growing as in Fig. 3 would be more conspicuous than those in Fig. 2.

The next step in the formation of the daisy head would be the suppression of each flower stalk, as in Fig. 4, making a head of flowers just like the eye of the daisy. The top of the flower stalk would at the same time become broadened out into a disc form, to accommodate all these flowers.

If the inflorescence of the hyacinth or bluebell be examined, a little leaf-like body called a *bract* will be seen at the base of each flower stalk. If the internodes between the flowers were undeveloped, these bracts would be brought all to one level around the base of the flower stalks; and if the flower stalks themselves were undeveloped, the bracts would form a whorl around the closely-packed head of flowers. This whorl may be observed in the daisy, but it will be seen that it is not the calyx. The calyx of each flower ought to be found near each of the little individual flowers; but as the function of the calyx is almost entirely protective, it is not needed in the daisy head, as each flower protects its neighbour, and the ring of bracts protects the outer ones. We therefore find, in flowers like the daisy, that the calyx is entirely absent or reduced to little more than hair, or that it performs an entirely new function, as in the dandelion, thistle, groundsel, etc. In these flowers it is very small at first, but after the flower is fertilised it develops into a light downy body attached to the seed below, and serves to disperse it by the agency of wind.

But evolution has been carried still further in the daisy. If the flowers were endowed with reason and speech, we could imagine a meeting of the little flowers addressed by one of their number thus: "Though we have done our best to overcome the disadvantage of our diminutive size by clustering together, we are still often passed over by our friends the bees, who do not see our modest yellow heads. Even our tall brother the tansy has found it necessary to bring a large number of flower heads together to render them conspicuous. We, however, cannot do that, as we have only one flower head on one stalk. I therefore propose that you flowers on the outside use all your strength to grow large, brighter coloured, and conspicuous. I know you will say that if you spend all your energy on show you will have no strength left to produce seeds. But leave that to the rest of us. You grow fine and large, and attract bees, and we will take care that sufficient seeds are formed. It will thus be the best for all."

We find in the daisy that there are two kinds of florets

FIG. 5.

a, Downy seeds of dandelion. *b*, Parachute seed detached and enlarged.

—those round the outside, called ray florets, being white, often tinged with red, large, and conspicuous. They are, however, barren, having no stamens or pistil, and serve chiefly for attractive purposes. The inside or disc florets are perfect flowers, having corolla, stamens, and pistil, and produce seeds.

Though much must remain hypothetical with regard to the evolution of the daisy, yet there are many interesting side lights thrown upon the theory. For instance, an example of the passage of one kind of inflorescence into another, of the opposite character to the one supposed to have taken place in the daisy, must be familiar to all. The cauliflower, as seen in the greengrocers' shops, has all its

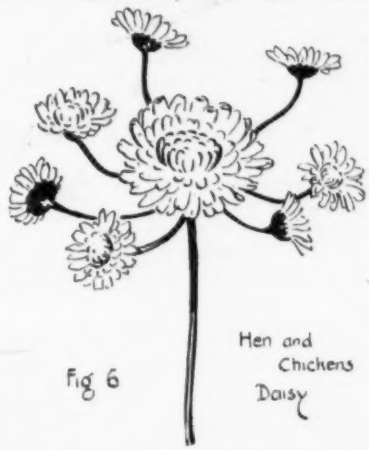


Fig 6

flowers clustered together at one level. But if it were left in the garden uncut, it would soon shoot up, and form an inflorescence not unlike that shown in Fig. 2. Then, again, there seems to be a tendency in some daisies to revert to a former habit of growth, and we have a few flowers shooting up on a stalk by themselves and leaving the main head. These small groups of flowers are often found all round the main head, and this kind of daisy has not been inaptly called by country people "hen and chickens" (Fig. 6).

Flowers with habit of growth similar to that of the daisy are classified under the same family. Because the head is composed of a great number of small flowers, they are called Compositæ. This family includes a very large number of our commonest and best known wild flowers—for example, groundsel, thistle, ragwort, dandelion, etc.

It is well known how plastic flower forms are under the hands of a skilful gardener, and perhaps no class of flowers is more easy of modification under cultivation than the Compositæ or daisy family. Hence we find them forming a considerable number of our ornamental flowers, among which may be mentioned the sunflower, cineraria, zinnia, marigold, dahlia, and the queen of the autumn—the chrysanthemum. The large beautiful flowers of the chrysanthemum have been produced mostly by modification in the form of the disc florets. They have become enlarged so that they somewhat resemble a magnified ray floret. This modification has been at the expense of fertility, very few of the flowers forming seeds; though if the head be examined more closely, by pushing aside some of the large florets, others bearing stamens and pistil may be seen.

A sketch of the daisy, however brief, would be incomplete without some reference to the origin of the name and the habit of closing. The name is, of course, a shortened form of "day's eye." The name might have been suggested by the form of the flower—the yellow centre corresponding to the pupil, and the brightly-coloured ray florets to the iris. But the name has been derived from its habit of closing at night and opening again in the morning, rather than from its form. The opening and closing movements are closely allied to the sleep and sensitive movements of several other plants. Atmospheric conditions, such as moisture and absence of light, affect the cells near the base of the ray florets, absence of light causing a greater turgescence in the outer cells. This causes the florets to bend inwards and cover up the disc florets. Opening is brought about by the increased turgescence of the inner cells of the ray florets. These sleep movements are beneficial to the daisy in several ways. The fruitful disc florets are preserved from the cold at night by being enfolded by the ray florets; and as the daisy is a flower of very low habit of growth, it is more particularly

exposed to the depredations of crawling insects, which would eat the pollen from the centre flowers. But before they can reach these flowers, they must first eat their way through the ray florets which enfold them. These, however, contain a bitter juice which is unpleasant to the insect palate, and they thus preserve the disc florets from being eaten.

It is hoped that the foregoing has served to show a few of the wonders wrapped up in such a simple flower as the daisy; and the writer would suggest that there is no more suitable subject for a lesson to an upper standard, not only because of the interest that the class would take in the chief of the foregoing facts, but because it is a flower with which all are acquainted, and even in a town school specimens may be obtained at all seasons, except in the depth of winter.

MAGNETISM AND ELECTRICITY.

Notes for a Lesson on Electric Tramways.

DURING the last few years the progress which has been made in England in the construction of electric tramways has been remarkable. Until a very short time ago, England seemed almost indifferent to the advantages of electric traction. This was due probably to several causes, amongst which the prejudice against overhead wires and the faulty legislation on the subject were the chief.

An awakening, however, has come, and at the present time electrical undertakings are developing in Britain at a rate hitherto unknown at any time or in any country. There is scarcely a large town in England without its electric tramway scheme.

In some cases there has been a conversion from horse or steam tramways to electric tramways; in other cases entirely new systems have been built. In many towns the schemes are only now under consideration, whilst in others the work has been definitely decided upon, and is either in progress or waiting only for Parliamentary sanction.

The effect which this activity will have upon the prosperity of the country must be very considerable, but the indirect advantages accruing therefrom will probably be very much greater. Let us reflect for a moment and think what will be the effect of increased facilities for rapid and cheap transit upon the congested state of London and our large provincial towns.

The Prince of Wales, speaking on the subject a short time ago, said: "By the provision of these facilities, working-men will be able to secure not only healthier but cheaper houses." Mr. Balfour, in the debate on the "Housing of the Working Classes Bill," said: "I believe that electric traction is going to play a far larger part in the solution of the difficulty than any of the strange schemes I have analysed." Sir Douglas Fox, President of the Institution of Civil Engineers, speaking to the London County Council recently, said: "The time is now close at hand when electric tramways will come, and they will bring immense benefit with them, not only to the poorer classes, but also to the well-to-do, who, when they have got over what is really a prejudice, will find that they are an immense convenience to them also."

If it is true that electric tramways will reduce the overcrowding, must it not also be true that the evils attendant on overcrowding must at the same time be greatly reduced?

A subject of this kind ought to be of great interest to teachers, not only because of their interest in the general welfare of their country, but also because of the improvement which it must effect in the homes, the health, and consequently the intellect and morality, of the children in their schools. The subject will also be of interest to teachers from another point of view. Children in the streets see tramways being constructed; they watch the workmen, and try to find out why they do so and so. When a child's mind is of itself inquiring about something, that moment is the true teacher's opportunity. If a teacher can encourage his pupils to notice what is taking place around them, and to observe accurately, he is fulfilling an important part of his mission.

In order to assist teachers in explaining the principles underlying the work of an electric tramway, this short article has been written.

It is in no sense intended as a full technical description, but is intended to supply some little information on the more important parts of a tramway system, such as could be understood by the older scholars in an elementary school, and which might form a basis for several lessons on electric tramways. Although it would be impossible, in the space at our disposal, to explain in detail the construction of a motor and a dynamo, still an attempt has been made to show how a rotatory motion can be produced by means of an electric current, and also how a current can be produced by a machine driven mechanically.

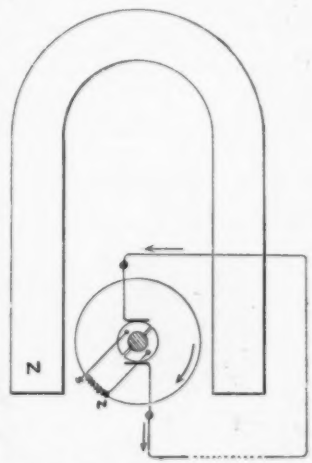
The Principle of the Motor and Dynamo.

If we take an ordinary sewing-needle and bring it into contact with a pin (not a brass one), and then try to remove it, we find that the needle comes away quite easily, and shows no evidence of any tendency to cling to the pin. If we take a horse-shoe magnet, such as may be purchased in almost any toy-shop, and with the marked end rub the needle from eye to point about a dozen times, we find, on again presenting either end of the needle to the pin, that the two cling together, and sometimes so much so that the needle is able to support the weight of the pin. In some mysterious manner the needle has become endowed with new properties: it has, in fact, become a magnet; and by means of its magnetic properties it is able to cause a pin to move even without touching it. If we now gently drop the needle lengthways on to the surface of some water in a dish, it will float, and will always turn its eye end towards the north. On bringing the marked end of the horseshoe magnet towards the point of the needle, we notice that the needle is attracted towards the magnet. On testing the eye end, we find that it is repelled.

On experimenting with the unmarked end of the magnet, we find that it acts in just the opposite way: it attracts the eye end, and repels the point of the needle. Thus, by means of the magnet, we can produce mechanical effects, and get attraction or repulsion as we wish.

Another simple experiment will take us a step further. If we take a strip of copper and a strip of zinc, and connect them by a long copper wire, and dip the strips into a dilute acid solution, we form a galvanic cell. Vinegar will serve for the acid, but dilute sulphuric acid will serve very much better.

On bringing the copper wire lengthways over the floating magnetised needle, the needle is deflected, but returns to its former position if the strips of metal are raised from the acid. Whilst the strips are in the acid, an electric current flows along the wire from the copper to the zinc, and we get evidence of this through the magnetic properties with which the wire appears to be endowed. By using a large number of cells or some other powerful source of electricity, we increase the effect. If we coil the wire into a helix or corkscrew coil, and send a current through it, we find that the helix behaves exactly like a magnet: one end repels and the other attracts the eye end of the needle. On reversing the direction of the current, we reverse the polarity of the helix. The attraction or repulsion is greatly increased by placing within the helix a bar of soft iron.



PRINCIPLE OF THE ELECTRIC MOTOR.

The helix and iron bar together form an electro-magnet, but this electro-magnet acts as a magnet only when the current is flowing. Electro-magnets will attract and repel each other just as ordinary steel magnets will.

Midway between the ends of a horse-shoe magnet suppose a

wheel to be mounted on an axle (as shown in the illustration on previous page), so that it can rotate freely in the plane containing the magnet. A small helix conveying a current is mounted on the rim of the wheel, with the axis of the helix in the direction of the circumference of the wheel. In the first case, suppose the helix is a little nearer the marked end than the unmarked end of the magnet, and the current is flowing in such a direction that the helix is attracted by the marked end. This will cause the helix to approach the marked end, and so move the wheel.

The attracted end of the helix will go as near as possible to the magnet as the wheel will allow it, but the momentum acquired will carry it on a little further; and this presents the other end of the helix to the marked end of the magnet, and the helix is then repelled. This causes the wheel to rotate further.

If, when the helix has passed a point midway between the ends of the magnet, the current in the helix is reversed, the end nearest the unmarked end of the magnet will be attracted; and when it has passed the nearest position, the other end of the helix is presented to the magnet, and the helix is then repelled.

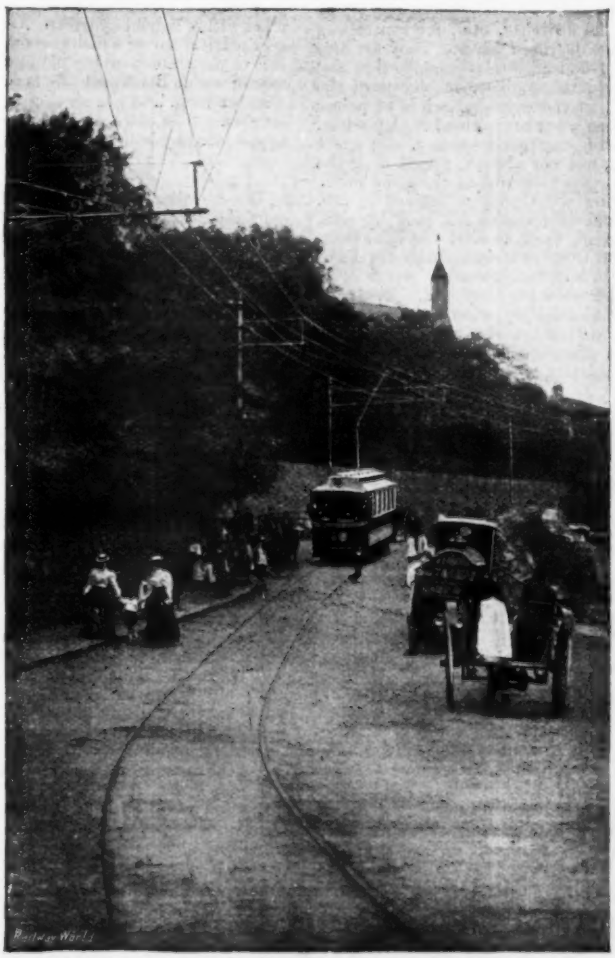
Hence, if by a simple apparatus we arrange so that the current is automatically reversed in the helix, as it passes a position midway between the two ends of the magnet, we can cause the wheel to rotate continuously. The rotating wheel can then be geared up with any machinery which it is required to work. This is the principle employed in many modern motors. In place of the horse-shoe magnet, it is usual to employ powerful electro-magnets; and a large number of coils are employed instead of one, and these have iron cores inside to increase the effect.

Having seen how it is possible to produce mechanical effects by means of an electric current, let us now study the method of producing an electric current by means of mechanical energy. If we take a coil of wire and connect the two ends to a delicate galvanometer, or current detector, and then bring the coil towards the pole of a powerful magnet, we find from the indication of the galvanometer that a current is produced in the coil of wire. When we stop moving the coil, the current stops. If we move the coil back again, we get a current in the opposite direction. In fact, so long as we are moving the coil towards or away from the magnet, we get a current. As in the case of the motor, we can mount the coil or helix on a wheel between the poles of a powerful magnet, and then by turning the wheel we can produce currents in the helix.

Indeed, if the wheel of the above motor were worked mechanically, an electric current would be produced in the helix, and this could, if desired, be used for working another motor. A machine constructed so as to convert mechanical energy into an electric current is termed a dynamo. The dynamos used for industrial purposes are generally worked by steam, gas engines, or water-power.

Now that we have got an elementary notion of the principles of the dynamo and the motor, two very important factors in the working of an electric tramway system, we may pass on to learn something of the method of utilising both of these for the propulsion of electric cars.

We may, for purposes of description, deal separately with the various portions of a modern electric tramway system. We shall first deal with a system equipped with overhead wires, as this is the type now generally adopted.



OVERHEAD TROLLEY WIRES AND ELECTRIC CAR AT SHEFFIELD.

The Permanent Way.

Perhaps the most important part of the work upon which the successful running of a tramway depends is the structure of the permanent way, or the railroad along which the cars are to run. It is essential that the rails should rest on a firm and durable foundation, and that they should be held firmly at the same distance apart at all times.

In preparing the foundation for the rails, it is usual to excavate the roadway to a depth of twelve or thirteen inches, and then put in a layer of concrete about six inches deep. On this, when set, grooved steel rails with a wide base, and weighing from 60 lbs. to 100 lbs. per yard, are laid. The ends of the rails are fastened together by plates of steel placed on each side of the joint and bolted to the rails. Wrought iron rods are placed across the track from rail to rail, to hold them at the right distance apart. As the return electric current has to travel along the rails, it is very important that the rail-joints should offer very little resistance to the flow of the current; otherwise there will be not only a waste of energy in overcoming the resistance, but there will be danger of a considerable portion of the current passing through the body of any person or horse stepping on the rails when the current is flowing, and thereby giving rise to serious accidents. In order to make the resistance small, the ends of the rails are bonded together by stout copper wires, which are riveted into holes drilled in the rails. Thick copper wires or bonds are also used to connect the two lines of rails together, so that they act as one as far as the current is concerned.

When this has been done and the joints tested, the usual roadway pavement is put down. This generally consists of wooden pavement blocks laid directly on the concrete, or of granite sets laid on a one-inch layer of sand.

Power-Station.

The station where the electric current is produced is called the "Power-Station," and is generally built on a site as near as possible to the centre of the tramway system, and near to a railway, river, or canal, so as to be in a convenient position for the supply of water and coal. The chief building at the power-station is the power-house, which generally consists of a boiler room and a machinery room. In the boiler room are erected the boilers for supplying steam to the engines. The steam, at a pressure of about 150 lbs. per square inch, is conducted through suitable pipes to the engines in the machinery room, where it operates the engines, and then leaves again to pass to the con-

densers. The engines are connected to the electric dynamos or generators which produce the current for running the cars. These dynamos are usually designed to produce an electric current at a voltage (or pressure) of from 500 to 550 volts.

In the power-house is also erected the switch-board, and this is supplied with various instruments for measuring and recording the strength and pressure of the current, and also with various switches for controlling the supply of electricity to the cables or conducting wires in the streets outside.

The Conducting Wires.

From the power-house covered copper wires or cables convey the electricity to various points along the route. These cables are covered with some insulating or non-conducting substance, and are placed underground. They are usually lead-covered, and drawn into earthenware pipes to protect them. The cables are connected to other copper wires, which distribute the current to feeder pillars and overhead wires.

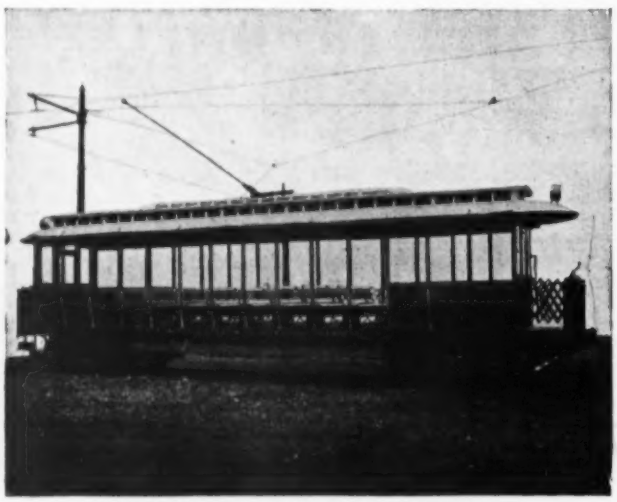
The feeder pillars contain the switches, etc., for controlling the feeding of the current to the overhead wires. They are also often connected with the power-house by telephone, so that any message can quickly be sent to the engineer in charge of the dynamos. The current is fed to the overhead wires at points about half a mile apart. These wires are termed trolley wires, and are composed of copper of very good quality, and quite uncovered. They are usually, but not always, placed over the centre of the track. Sometimes they are placed along the sides.

Three methods of suspending the trolley wires are in use. Where the roads are wide and two tracks run side by side, centre poles with double arms are used, so that the same poles serve for both tracks. Where there is only a single track, or where the roads are not sufficiently wide to allow centre poles to be used, side poles with single arms are employed. In streets with buildings on both sides, the trolley wires are sometimes supported by wires stretching across the street. The poles are usually of steel, but the trolley wires are insulated from them by means of porcelain or other insulating supports.

The Cars.

The electric cars are supplied with motors, which are placed beneath the floor of the car body, and are supported on the trucks beneath. There are generally two motors, which can be used separately or in conjunction with each other. The current is fed to the motors from the overhead trolley wires by means of a gun-metal pulley or trolley which runs along the wire. The current passes through this, down the trolley pole, and on to the motors beneath the car.

The motors are connected to the wheels, which are thus caused to rotate and drive the car. The current passes from the motors through the wheels to the rails underneath, and thus back to the power-house.



SINGLE-DECKED CAR AS USED AT BLACKPOOL.

The types of car now in use are very various, and are often specially designed to suit the requirements of the district and the character of the route along which they have to run. In England, when it is possible, double-decked cars are used; but in some cases where the cars have to pass beneath low bridges or arches this is impracticable. In hot countries uncovered outside seats are not generally provided.

Generally the cars contain only one compartment, with a door at each end; but in some cases, as at Swansea, some of the cars are divided into a smoking compartment and a non-smoking compartment; whilst at Sheffield it has been proposed to divide the cars into first and second class compartments.

ELECTRIC TRAMWAY AT NICE.

The driver operates the car by means of a controller, which enables him to regulate the speed of the car. He also has charge of the brakes for stopping the car. Each car is supplied with a lightning arrester, an electrical device which prevents harm being done by lightning. One of the accompanying photographs shows one of the new cars now in use at Blackpool. It is of English manufacture, is 40 feet 3 inches long, and has seating accommodation for sixty-five passengers. The sides are open, and this type of car is much appreciated by holiday-makers at this popular summer resort.

Car Sheds and Repair Shops.

The car sheds and repair shops are situated sometimes alongside the power-station, but more usually on some portion of the route, on the borders of the system, where land is cheaper. The sheds contain inspection and repair pits, so that workmen can examine the trucks under the cars without lifting the cars up.

The repair shops are supplied with lathes, drills, and all appliances required for the repair of cars, and sometimes even for the complete building of cars.

Other Systems.

The only other systems of electric tramways of any importance are the conduit system and the surface-contact system.

In the conduit system, the conductors conveying the current to the cars are placed underneath the surface of the roadway, in the middle of the track. A metal collecting-shoe passes through a slot, and by means of special springs makes contact with the copper or iron conducting-rods.

As in the case of the overhead trolley system, the return current passes back to the power-house along the rails.

This system possesses the advantage that no poles and no overhead wires are required. This advantage is, however, more than counterbalanced by its disadvantages. It is found, in practice, that the underground conduits get choked with dust and mud, and sometimes this causes the tramcars to stop working until the conduit has been cleaned. This system was tried some years at Blackpool, but it proved so unsatisfactory that it has recently been converted into the overhead system.

The surface-contact system differs from the other two, in depending for its working on the current being fed to the cars by means of studs rising from the ground for about an inch. A collecting-shoe on the car slides over these, and takes the current for the motors. This system has not, however, been used to any extent in this country.

Conclusion.

We may now summarise the advantages of electric cars.

By means of electric cars a more regular and efficient service can be given than with horse or steam cars, and the roads are kept cleaner. In crowded streets less room is occupied. All the power required can be generated at one station, and therefore more economically than if developed on the cars themselves.

There is little loss in the transfer of energy by the electric current. The cars can be run more quickly than is possible with horse-cars, and thus time is saved, and at the same time they are more completely under control. The cost of working is about fifty per cent. less than with steam, and about half the cost of working with horses.

The smaller cost of working enables lower charges to be made, and thus people are enabled to live at greater distances from their work and yet get to it easily. The cost of working tramways varies in different districts, but on the average the cost of working an electric tramway is about 5d. per car mile, whilst with steam it is about 7d. to 9d., and with horses 11d. per car mile.

Our thanks are due to *The Tramway and Railway World* for kindly supplying the illustrations for this article.

OBJECT LESSONS IN HISTORY.

ST. SAVIOUR'S, SOUTHWARK.

PATRIOTISM at the present time is running quite high, and consequently there is a pretty general agreement with the opinion of the School Board for London that history should be one of the chief corner stones of a young Briton's education. And the new Code, with its block grant and the encouragement it offers to elasticity and to originality of treatment of all subjects taught in the primary school, is making the way quite clear for the introduction everywhere of history teaching. But with respect to this subject, as with all else, our plans must be limited by the short school life of our scholars, and it may be found wiser to treat it rather from its concrete than its abstract side, leaving the latter to the evening school or polytechnic lectures later on. To explain what is meant by concrete treatment, we may be allowed perhaps to refer to those interesting school journeys with which this journal has from time to time made us acquainted. Both at home and abroad these have given to country children the best possible opportunity of becoming acquainted with geography, geology, and other branches of nature-knowledge at first hand; but they have done nothing whatever for that ever-multiplying unit of modern civilisation, the town child. For him, and especially in the parts where he most abounds, no walk however long would lead beyond the area of bricks and mortar, and of course a railway fare is out of the question. And yet, for the common good as well as for his own, this is the child who most needs arousing to the meaning of those words "our country." We think "My Lords" had such as these particularly in view when they allowed us, as an alternative interest, the opportunity of visiting with them local museums, historic buildings, and other places of interest.

Let us think for a moment what the lives of children who of necessity live in the poorest districts of large towns are like; and to be definitely objective, we will, if we may, take a special portion of the metropolis which in higher degree is typical of all. Shall it be the south-eastern side of the Thames, where lies a parish which even Greece cannot outrival for classic associations, and yet which is so poor to-day that eighty per cent. of its inhabitants are born and live and die in one-roomed homes? (If Macaulay's New Zealander happens by this time to take in and read THE PRACTICAL TEACHER, he will most likely ask us here, "Why do you spend a hundred millions on righting a few wrongs at the extreme edge of your empire, whilst allowing this dry rot to go on at the centre? Are you not afraid some day of expiring from heart disease?" To which some of us might reply thus: "People whose temperature stands at 104° from imperial fever are too delirious to think of future worse disease).

Well, we were just saying that the ancient spot on the Thames's southern bank is very poor and yet steeped in history: the latter fact may be used as a little compensation for the former to the enormous number of children who crowd into the numerous schools around. You will find as many school children here as would make a large town's total population anywhere else; and as in a few years the army and navy will draw largely from them, teachers feel it a pleasant task to let them know, by the lessons of their immediate neighbourhood, how it is their country is worth serving. Every stone of the ancient highway that leads south of London Bridge echoes fascinating history. We will speak somewhat more in detail of it in our next paper, and for the present take for our object lesson the oldest building it has to show. This is

The Collegiate Church of St. Saviour's, Southwark,

which has recently been restored to its original beauty, and is to be the new South London Cathedral. But how can it be utilised educationally? Not at all till many lessons on our earlier and later history have been given. When some knowledge has been gained of London in Roman and in early Saxon times; of Norman London and the Crusades; of Elizabethan London with its Shakespeare, Massinger, Beaumont and Fletcher, and its Globe Theatre; of Puritan London with its John Bunyan and its little meeting-houses hiding away in Zoar Street and elsewhere; of Queen Anne's London and its Sacheverell riots; of Georgian London with Dr. Johnson and Oliver Goldsmith—then a visit cannot fail to be of vivid interest to a group of young Londoners. We suppose few teachers will trouble the children with much about the architecture, which, however, is a great treat for themselves; but if the earlier poets Gower and Chaucer can be made familiar, and the growth of our American colonies also, just enough to familiarise them with the names of Harvard and Emerson, we think we have plant enough by which to rear a goodly fabric of home-produced history.

As the little party nears the beautiful edifice, we can fancy their guide helping them in imagination to clear away all its present most unlovely surroundings; away goes that hideous railway bridge (which surely only a nation of shopkeepers could so tamely endure), and away, too, the squalid back streets and all the ugliness of the vegetable market, and he reduces the highway to its original level, which is that of the church, and leads them back to far-off times when all was beautiful, and where along the banks of the river, east or west, the bison, the red deer, the boar, and sometimes the wolf came down to drink. This was before any bridge was built, and when the crossing and re-crossing of the river was done by old John Overy (over the water), who, with his pretty daughter Mary, lived close by. Legend has always some truth in it; and, besides, children must have some other food than the dry bread of well-ascertained facts. So let them hear of old John's penury, and how he wanted to add to his pile, and bethought him that if he feigned death his servants, according to custom, would mourn and fast for three days, and he could arise then, with their keep-money to add to his store. But he, the host, bargained without his servants; for they were so glad to be Mary's retainers instead, that they began to most convivially rejoice. Poor old John could not bear this unexpected reaction, and rising from the dead, made for the high life that was going on below stairs. The terrified domestics, believing they saw a ghost, took panic; but one, more lusty than the rest, took instead a good oak club, and soon made the pretence of death a reality. Thus bereaved, Mary, in dire distress, sent off post-haste to her lover to come to her help; and he, equally in haste, mounted horse and set out; but on the way the bad roads led to a fall, and poor Mary was now bereft of her only protector. This, according to her times, she regarded as a sign that a religious life was to be hers, and therefore she established here, with her great wealth, a sisterhood. Later on another lady founded on the site a college of priests; and still later two Norman knights (the effigy of one still remains) made of it a priory, of which the present church was the chapel. To the latter founders we owe what remains of rounded arches. And Mary Overy's name (St. Marie Overie) was the title of the church till the Reformation.

Now the party enters the building, and going straight to the north chancel aisle stands before *The Crusader*, who was once a real live lord of Southwark, attending Prince Edward in the last crusade. What tales did he tell his neighbours on return? was he the man who taught us to use damask tablecloths? Those old Crusaders, though failing in their ultimate object, brought so much useful knowledge home, gained by their notes and observations on the road, that England began to move apace. If the children know the little formula about the number of crusades a man had engaged in by the crossing of the legs above or below the knee, they can read a little further into the personal history of this old Earl of Surrey.

And on the same north side, but lower down in the nave, they will see the original tomb of the early English poet *John Gower*, who was a resident in this parish, like his pupil *Chaucer*. On the opposite wall there are memorials of the greater *Shakespeare* and of his brother Edmond (who lies buried here), and of *Massinger*, *Beaumont* and *Fletcher*, all of whom lived, during the most brilliant periods of their lives, within the shadow of this building; for was there not close by that wonderful little *Globe Theatre*, where these geniuses played? and did not the greatest of them all produce in a little lodging hard by his masterpieces of dramatic literature?

And there, too, is the name of a much later poet—why is *Oliver Goldsmith* here? Because he, too, belonged to this wonderful parish. In Bankside, just without, poor Noll had practised as physician in that part of his life when he was too poor to buy a decent coat, and was fain to hide the holes in his old one with his hat whilst he talked to his lady patients. This was about the time that his friend *Dr. Johnson*, whose name also is close by, was the constant visitor at Mr. Thrale's, the great brewer, to whom Barclay and Perkins succeeded. The doughty doctor is well commemorated, for we have immortalised him also in the Abbey and in St. Paul's. Alluding to the brewery reminds us that under its stables, undisturbed, lies *Cruden*, whose concordance fame gives him a right to the memorial that is contemplated here, just where one reads his name. And there, near, is that of *John Bunyan*, and for what reason? The children love his chief work, and will be glad to hear that during his frequent visits to London he was accustomed to minister to a little flock of Puritans, who were glad to meet in quiet Zoar Street, behind the church. To mention the religious intolerance then existing, though less persecuting than formerly, leads naturally to the story of *The Ladye Chapel*, with its memorial windows to the seven Anglican martyrs, whose condemnation within its walls stains the name of cruel Mary. This beautiful chapel, after that dark day, fell to very low uses, becoming in time a bakery; but we have known a child say the making of bread for men to live by was a less desecration than taking away such innocent lives. The philosophic child has the sympathy of those who believe that decay is the natural result of bigotry. Our noble ecclesiastical buildings are more cared for in a tolerant age than ever.

In the same chapel lies a more pleasant subject of thought, for there on a tomb lies the recumbent effigy of Bishop *Lancelot Andrewes*, the learned Orientalist, to whom was entrusted, as one of the Westminster company of Ten, the translation of the Pentateuch of the Authorised Version. Children who have learned the meaning of the preface to their Bibles will be glad to meet him here.

It is almost time to pass out again to the modern world, with its buses, and railway whistles, and Tower Bridges, and all else; but just before we do so, let us look about for a minute or two, and picture Queen Anne coming in with her ladies-in-waiting all "incog" to hear the fiery *Sacheverell*, who just then had set all London by the ears. By the way, it seems meet that her memory and Samuel Johnson's should jostle each other here; for was she not the last Stuart to touch for the king's evil, and he, as an infant of three, one of the last to be touched by her royal fingers?

Now, just by that little quaint and fulsome brass to the memory of a child of ten, we step over some *tesseræ*—all we shall see here of Roman London—and whilst the young folks are looking at that, their guide may detach himself for a minute to look closer at the small tablet on the wall near to the memory of William Emerson (1575), "who lived and died an honest man." To those who admire the great American Emerson, it is pleasing to know that almost without doubt here lies his ancestor. Curiously too, *Harvard*, the founder of the university, of which so far Emerson's is the greatest name, was baptised in 1607 at the font of this church.

There is much more the guide could tell; but a child's mind must not be overburdened, and enough has been seen to convince them that historically they are citizens of no mean city, although the streets to which they must immediately return are among the meanest in the world. But what has been may be again, and pride in one's country may lead to that divine discontent in the children which some day may restore this most wonderful of all parishes in the British Isles to the condition its past claims from us.

An Illustrated Syllabus of Art Instruction,

FOR

FIRST-YEAR PUPILS IN A SCHOOL OF SCIENCE,

Appears in THE PRACTICAL TEACHER'S ART MONTHLY for August. Now Ready.

PRICE TWOPENCE.

THE ELEMENTS OF SCHOOL HYGIENE.

BY ARTHUR NEWSHOLME, M.D., F.R.C.P. (LOND.),

President of the Incorporated Society of Medical Officers of Health; Examiner in State and Preventive Medicine to the Universities of London and Oxford.

INFLUENCE OF SCHOOL LIFE ON EYESIGHT.

THE influence of school life on the eyesight may be considered under two heads—according as it is of an educational and disciplinary character, or, on the other hand, produces under unfavourable conditions deleterious effects.

Perhaps the educational aspect of the subject may be better understood after an appeal to comparative physiology in its simplest form. One of the lowest known forms of animal life is the amœba, a minute bit of undifferentiated protoplasm about $\frac{1}{2000}$ inch in length. This tiny being is absolutely without any organs—it has no stomach, lungs, muscles, or brain—and yet it contrives to carry on digestive and respiratory functions, to move and to perform deeds which are apparently connected with volition, in the absence of all the organs which are usually associated with these functions. If we were to imagine an animal in which each of the chief functions of the body had a special bit of protoplasm dedicated to its performance, the respective functions would, in consequence of this differentiation, be more perfectly executed. Such differentiation is exactly what has occurred in the case of the higher animals. It is not, however, altogether unattended by disadvantages. The parts of the organism set apart for a special work cease to be able to perform any other than their own function, and the consequences of injury to any one organ are less capable of being compensated for.

One of the most important differentiations that occur in higher animals is that of the nervous system. One part of the nervous system (the brain in particular) is set apart for the reception and interpretation of sensory impulses received from outside the body; and it is dependent for its communication with the external world on the nerves, which bring impressions of touch, or smell, or taste, or sight, or hearing from the periphery. The sensitiveness of these special senses is capable of very wide and almost unlimited cultivation. Each special sense requires special cultivation, and becomes skilled in proportion to the education it receives. The sense of touch may be instanced. In the blind this usually becomes extremely acute. The blind sculptor Giovanni Gonelli was said to model the most striking likenesses entirely by the sense of touch. The blind have been known to become proficient in conchology and botany, guided simply by the sense of touch. Some blind persons have acquired the faculty of distinguishing the colour of fabrics by the sense of touch alone. The other senses are equally capable of cultivation to an extent which appears almost incredible.

It is to be feared that, with the extension of mental education, the special **education of the senses** has been to some extent neglected.

The kindergarten system, by cultivating the appreciation of form and colour and the powers of observation of children, should do much to remedy these evil effects. It has been demonstrated that, with the increase of civilisation, the acuteness of vision, especially for great distances, has diminished; and that those races living on extensive plains, or who dwell on the borders of the

sea, and who have seen little or nothing of books, have the most piercing vision.

In one respect—namely, in regard to **colour-vision**—civilisation has brought with it an improvement in the powers of vision. Mr. Gladstone, I believe, first pointed out that very few colours are mentioned by Homer, and of these nearly all are misapplied. Similar evidence of defective colour-vision in former ages appears to be derived from the sacred books of the Hindus. There is reason to believe that in the early ages of man's history only white light was perceived, and that red colours were first differentiated, the others being subsequently appreciated. These conclusions are confirmed by the fact that at the present time colour-blindness is much more common among men than women, also, it is stated, among the Society of Friends than among the general public.

It is interesting to note that Dalton, the propounder of the atomic theory and a member of the Society of Friends, was colour-blind, and was the first to study the subject of colour-blindness, whence the name of **Daltonism** by which it was first designated. It is narrated that he refused to fulfil the necessary condition of presentation at court by wearing court dress. This difficulty was overcome by his friends substituting a scarlet cloak for his dark grey one, which he wore without being aware of the change which had been made.

It is a well-known physiological law that **disused organs tend to waste.** Muscular exertion increases the power of further exertion; mental application, when not misapplied, renders further mental work easier and more effective; while disuse of muscles or brain is followed by wasting and inaptitude. Some of the lower animals appear to warn us not to neglect the use of any organ with which we are endowed, and which is fitted for regular and steady work. The eyes of the mole, through constant burrowings in the earth, have retrograded in their structure; one of them is often found to have its connection with the brain cut off. The proteus living in the subterranean streams of Styria, the eyeless insects and spiders of the caves of Kentucky, are other instances of the same degeneration and atrophy of structures formerly present but atrophied in association with disuse. The warning which these cases from the region of comparative anatomy embody is perhaps scarcely required in our case, but it may serve to emphasise the importance of a well-balanced and studied cultivation of the special senses. The detailed consideration of this subject belongs rather to the regions of pedagogy than those of physiology or medicine, but these passing remarks may not be destitute of utility.

We proceed now, however, to the study of the defects of vision connected with school life, their causes, their consequences, and their remedies.

In order that we may understand what will be said on this subject, I must, for the sake of some of my readers, assume an ignorance of the **anatomy of the eye** which is probably by no means general, and describe very briefly the salient points of the structure of the eye. The eyeball (see Fig. 1) is nearly spherical in shape, and about one inch in diameter. It is pierced behind by the optic nerve, which puts it into communication with the brain. Throughout the greater part of its circumference it is covered by a dense white membrane, the sclerotic, in front of which is the more convex and transparent membrane of the cornea. The general shape of the eyeball is maintained in its posterior $\frac{4}{5}$ by the vitreous humour, and in front by the aqueous humour. Behind the cornea comes the muscular partition known as the iris, within which is the circular aperture of the pupil, and the varying size of this controls the amount

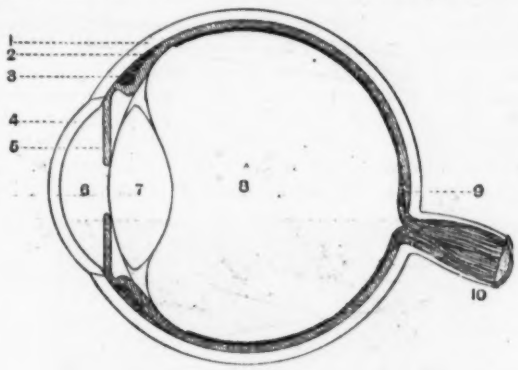


Fig. 1.

VERTICAL SECTION OF THE EYEBALL.

1, Sclerotic; 2, choroid; 3, ciliary muscle; 4, cornea; 5, iris; 6, aqueous humour; 7, lens; 8, vitreous humour; 9, retina; 10, optic nerve.

of light which enters the eye. These variations in the size of the pupil are controlled by an automatic nervous mechanism, the pupil dilating in the dark and contracting in bright light. The inner surface of the sclerotic is lined by a dark velvet-like cup called the choroid, which serves to absorb the superfluous rays of light, and thus prevent dazzling. In albinos the pigment of this layer is absent, and consequently they can see better with a dim light. Within the choroid is the delicate nervous membrane known as the retina, about $\frac{1}{100}$ inch thick, which forms a sort of expansion of the optic nerve, beautifully adapted for receiving impressions of light, whence they are transmitted by the optic nerve to the brain. Just about $\frac{1}{10}$ inch to the inner side of the point where the optic nerve enters the eye is the most sensitive part of the retina, on which rays of light must be focussed in order that distinct and accurate vision may be effected. The focussing of the rays of light on this point is effected chiefly by means of the lens (7, Fig. 1), which is placed near the front of the eyeball, and by means of its doubly convex surface brings the rays of light towards a focus. Connected with the edges of the lens are certain minute ciliary muscles (3, Fig. 1), which, by means of their contraction, pull the supporting ligaments of the lens and increase the convexity of its anterior surface, and thus bring rays of light to an earlier focus. These minute muscles, as we shall find shortly, are only brought into action when the eye is used for near objects.

A convex lens has the power of bringing rays of light and heat to a focus behind the lens, at a distance which depends on the degree of convexity of the lens. We have examples of the focussing of the heat rays of the sun in the firing of a charge of gunpowder, or of tobacco in a pipe, by means of a pair of convex spectacles. This result occurs only when the rays of heat are brought to a focus or point on the object to be burned. Similarly with the rays of light, in order that an object may be distinctly and clearly seen, it must be focussed on the retina, and perfect vision is practically confined to rays of light focussed on the yellow spot of the retina.

Now the luminous impressions received by the eye are derived from remote or near objects. In the former case, the rays of light impinge on the front of the eye

in a parallel direction; in the latter, they are divergent in direction. The normal eye is so constructed that rays of light coming from distant objects—that is, parallel rays of light—are brought by the lens to a focus behind it which corresponds exactly to the yellow spot of the retina. **Distant vision consequently involves no muscular exertion** of the eyes, but simply the passive reception of the impressions of light, as in 2, Fig 2. But in looking at objects near at hand, it will be seen that unless some change occurs in the lens, rays of light will not be focussed on the retina, but some distance behind it, and distinct vision is consequently impossible. It is at this point that the **mechanism of accommodation**

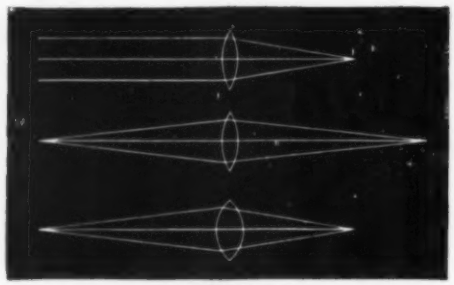


FIG. 2.

DIAGRAM SHOWING EFFECT OF A BICONVEX LENS ON RAYS OF LIGHT.

1, Focus of parallel rays; 2, focus of divergent rays; 3, focus of divergent rays brought nearer by a more convex lens.

comes into action. The minute ciliary muscles in the interior of the eye contract, and cause a bulging forward and increased convexity of the lens; and at the same time the internal recti muscles contract, and cause the axes of the two eyes to converge, so that corresponding images may be produced on the retinæ of the two eyes. The amount of accommodation of the shape of the lens is in the normal eye exquisitely adapted to the necessities of the case; so that with varying distances of the objects to be seen, the image may be accurately focussed on the retina. The result of increasing the convexity of the lens of the eye is shown in 3, Fig. 2.

Now it will be observed that **near vision** implies muscular exertion, and muscular exertion implies a tax upon the nervous system. Consequently, as in the case of all other muscles, fatigue and strain may occur, unless the exertion is adapted to the strength and accompanied by proper intervals of rest. The shortest distance at which an object is visible is called the **near-point.** It is about six inches from the eye in the young. As age advances, the lens becomes less elastic, the minute ciliary muscles less active, and the power of accommodation for near objects becomes diminished. An aged person may have perfect sight for objects at the other side of a room, but usually requires convex spectacles for reading purposes. One of the first evidences of advancing age is the fact that the book is gradually held at a longer distance from the eyes.

There are three defects of the eye which are of the greatest importance in connection with school life: Hypermetropia, or far sight; Myopia, or near sight; and Astigmatism, or slow sight.

Hypermetropia and astigmatism are congenital conditions, and cannot be ascribed to school life. Myopia may also be congenital and hereditary, but is always aggravated and most frequently acquired under the influence of school life.

Let me explain first what is meant by hypermetropia. It is a normal condition in childhood, and only becomes a morbid condition, representing an arrest of development, when it persists. In it the eye is too short from before backwards, too flat, so that even parallel rays of light proceeding from a distance are not brought to a focus on the retina, but a little way behind it. Consequently even for distant objects an effort of accommodation is required; the ciliary muscles must contract, in order to increase the convexity of the lens and bring the rays of light to a focus at the right point. This being so, it will be evident that the eyes are being tried more or less during the whole of the waking hours. Whenever, however, application is made to near work, as reading or sewing, matters are very much aggravated. The ciliary muscles require to contract still more forcibly, in order to produce a sufficient bulging forward of the lens to enable the rays of light to be focussed on the retina. This increased exertion and strain produces congestion of the eyes; they begin to look red and inflamed. A sticky secretion forms about the lids, and they tend to stick together in the mornings. The child after a short time at reading appears disinclined for further work, and is often punished for being lazy. He frequently complains of headache and weariness, and this is ascribed to "biliousness" or some other cause, but not to the overstrained eyes. The headache and redness of the eyes diminish or disappear in the intervals of school work, and the child returns to school on each successive morning to renew and aggravate his sufferings. The child is often found to be worse as regards power of vision in the morning than in the evening; but this is strictly comparable to the sense of weariness felt in the morning after a day of hard walking. After a short walk the weariness and aching pass off; and similarly, the muscles of the eye after a short exertion begin to adapt themselves better to the strain put upon them.

Not uncommonly, also, the child is noticed to hold the book near to his eyes, and thus give rise to the suspicion that he is near-sighted instead of being hypermetropic or far-sighted. The explanation is that the effort required to bring the lens into a sufficiently convex condition to see the printed matter of a book at a moderate distance is so great that the ciliary muscles overdo the effort, and by their spasmodic and violent contraction produce such a convexity of the lens that

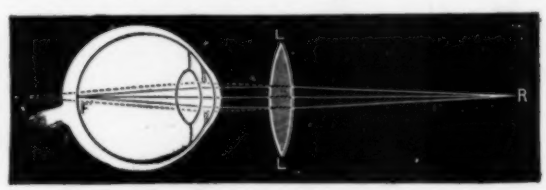


FIG. 3.

SECTION OF HYPERMETROPIC EYE.

R, The source of divergent rays of light; r, the focus behind the eyeball; LL, convex glasses to be worn by hypermetropic scholar; r′, the focus of rays of light on the retina, showing the influence of L.

the rays of light are focussed in front of the retina. The child, therefore, holds the book near to his eyes—which leads to further spasm of the ciliary muscles, and thus the complaint tends to intensify itself.

(To be continued.)

ANIMAL PHYSIOLOGY: THE EYE.

Printed in FULL COLOUR, on dark background, on strong Manilla Paper. Size, 34 in. by 30½ in. Mounted on Roller to turn over. Price 2s. 6d.

T. NELSON AND SONS, 35 and 36 Paternoster Row, London, E.C.

Our Monthly Retrospect

EDUCATION IN ENGLAND.

N.U.T. NOTES, ETC.

BY T. B. ELLERY, F.R.G.S.,

President of the National Union of Teachers, 1895–96.

The Tenure Problem. In last month's notes reference was made to the Tenure question, which, outside domestic matters, is the subject occupying the greatest amount of Executive time and effort at the present moment. It had been intended to hold public meetings in various centres to protest against capricious and unjust dismissal of teachers; but after Sir John Gorst's statement, no further progress has been made with the arrangements for these meetings, it being felt that if Sir John can induce the Government to take up the question and deal with it on the lines laid down in his speech in the House, all will be well.

What is the Union's position in the matter? Simply this, that no teacher shall be dismissed from his post without reasonable and assigned cause. This cause must, of course, be given in writing, so that the teacher may be able to appeal to the law courts if he feel he has been unjustly dealt with. To make the appeal effective and complete, the Education Department, in the event of a decision favourable to the teacher being obtained, should refuse to pay to the school any Government grant unless the teacher be reinstated. When this is the position of the tenure question, there will be few difficulties, as teachers who are justly dismissed will not care to hurry into a court of law, and, on the other hand, managers and school boards will think twice before they lay themselves open to proceedings which will make them appear ridiculous in the eyes of their local friends and supporters.

Whether anything definite can be secured in the present session is, at the time of writing, uncertain; but the Union leaders entertain hopes. One thing is quite certain: no effort has been wanting on the part of Messrs. Yoxall and Gray to secure success. It is quite certain, too, that the great bulk of Parliamentary opinion is in favour of legislation in this direction, and nothing has helped to form this opinion so much as the passing of the Superannuation Act. Those of us who were most closely connected with the superannuation movement always said the passing of that Act would undoubtedly be followed by legislation in the direction of securing reasonable security of tenure for teachers. The argument was: Superannuation (even if it is not what it ought to be) *plus* reasonable security of tenure, which the passing of the Act will bring about, must surely be better than no superannuation and no security. Yet some teachers objected because they could not have all they wanted, and no doubt a few will object still.

The Law and Tenure Work of the Union. Formerly one committee was sufficient to deal with the law work of the Union, but of late years it has been found absolutely necessary to appoint two committees—the Law and Tenure—Dr. Beach presiding over the first, and Mr. T. H. Jones over the second. Frequently from twenty to thirty cases are considered in the course of an evening, and sometimes even a larger number. Many of these are amicably settled; the remainder, if approved, are taken to the law courts. One of the most recent libel cases was that in which Mr. F. F. Wheeler of Cheltenham was plaintiff, and the proprietors of *The Cheltenham Mercury* the defendants. "The Man in the Moon," in the course of certain "Notes upon Passing Events" in that journal, wrote the following, at a time when Mr. Wheeler was seeking re-election upon the Cheltenham Town Council: "One thing that ought not to be forgotten is that, if Mr. Wheeler was elected, he would have again to neglect his scholastic duties, for which the Government pay him." All that was asked for on Mr. Wheeler's behalf was an apology and payment of costs, and at the last moment he was prepared to accept a withdrawal and apology together with judgment for £5, that sum to be paid as a subscription to one of the Cheltenham hospitals.

The defendants, however, elected to fight the case to a finish—a decision which now they have every reason to regret, for the jury returned a verdict for the plaintiff, and fixed the damages at £100.

All who know Mr. Wheeler will congratulate him upon the result. It was clearly proved that there was no justification for the libel, all the evidence going to show that the plaintiff, who has had charge of his school for thirty-five years, had never attended to his council duties during school hours.

It will be remembered that Mr. Wheeler was for a considerable period a member of the N.U.T. Executive, being first elected "one of the twenty-four" in 1889, when he polled 2,421 votes, having previously served for several years as a District Union representative.

This case is typical of many undertaken by the Executive in defence of members of the Union. Surely the non-member ought to be able to see by this time that protection can only be secured within the organisation which has done so much for the whole teaching profession. It should be remembered by all concerned, however, that it is too late to seek membership *after a difficulty has arisen.*

Superannuation in the Isle of Man and the Channel Islands. For some time past efforts have been made by the Superannuation Committee of the N.U.T. to induce the Government to extend the superannuation of teachers to the teachers serving in the Isle of Man and the Channel Islands.

At the outset there were several difficulties, but one by one these have been removed, and now there is a good prospect of legislation. Replying to Mr. Yoxall, Sir Matthew White Ridley said, in the House of Commons, that a Bill was nearly ready, and as he hoped it would be unopposed, he would consult with the leader of the House to see when it could be introduced.

Great credit is due to Mr. Yoxall for the very able manner in which he has tried to meet the wishes of the Island teachers in this matter of superannuation. It has been a labour of many months, and it need hardly be said that this question to Sir Matthew by no means represents his work on this particular subject. There is no exaggeration in saying that tact, skill, and energy characterise all the general secretary's efforts for the profession, both in and out of Parliament.

Election of Annuitants and Orphans. The figures published yearly by that gallant worker for the Orphan and Benevolent Funds, Mr. B. South of Manchester, ought to convince the apathetic and the selfish that there is no excuse for their apathy and selfishness. If these are not sufficient, then the recent election of annuitants and orphans should do something to create an interest in the good work. There were twenty-five candidates for *seven* annuities, the lowest successful candidate polling 3,447 votes; and no fewer than forty-seven children were entered for *fifteen* home allowances of five shillings a week. At the same time four boys were elected to the Sydenham Home and two girls to the Sheffield Home. Do teachers realise the responsibility involved in these elections, and the thousands of pounds necessary for the efficient carrying out of the work?

Mr. South points out that last year 105 associations, numbering 3,035 members, subscribed *nothing* to the Funds! He and the council gratefully acknowledge that this year there are only 72 associations, numbering 1,903 members, who do not contribute. Still, that there is room for further improvement can be seen from the following figures:—41 associations (1,885 members) contribute less than 6d. per head, and 9 associations (424 members) contribute only 1d. per head. The members of the council who so devotedly give their time, thought, and energy to the work of the Funds deserve the support of every teacher in the country. What is wanted no doubt is an *inclusive subscription*—one that will admit the subscriber to all the privileges of the Union and of the Funds. Whether the time is ripe for this it is impossible to say, but certainly no harm would be done by referring the question to the associations for consideration and report. Even then, if the additional fee is fixed at five shillings only, there will still be room for special efforts, for at least twenty thousand pounds a year should be secured. And many years' experience on the councils leads one to say that the money could and would be well spent. Will those who have hitherto held aloof from this grand work lend a hand in the coming year to enable those who are concerned with the administration of the Funds to render assistance to every incapacitated teacher and every little orphan child in need of such assistance? THE PRACTICAL TEACHER has made a similar appeal before, and, one is glad to admit, not unsuccessfully. Will readers of the journal kindly remember that the *need is greater than ever?*

The Future of the Voluntary School System. The present writer had the pleasure of submitting to the recent Ely Diocesan Conference the scheme given in the June issue of this journal. It was not to be expected, of course, that all the changes proposed would pass unchallenged; but, on the whole, the scheme met with a favourable reception, and was finally referred to the Diocesan Board of Education for consideration and report. In the course of the paper which accompanied the scheme, suggestions were made for the abolition of (1) the annual examination in religious knowledge in favour of a system of inspection, and (2) the organising visitor. Neither is necessary, nor can it be alleged that either makes for efficiency. In the course of the debate on the paper and the scheme, the Rev. Canon Stokes admitted there ought to be greater security of tenure for the teacher. "There have been, no doubt," said he, "dismissals which could not be justified." It was certainly a new experience for one to hear in the north transept of Ely Cathedral a clerical speaker denouncing unjust dismissals of teachers. Nor was the speaker giving his own opinions only, for the applause (yes, applause in the Transept!) with which his remarks were greeted showed conclusively he carried at least a portion of his audience with him. Another point of interest was to be found in the fact that the present writer's resolution proposing the scheme (which included reasonable security of tenure for teachers) was seconded by another clerical gentleman—the Rev. Canon Punchard, D.D., an educationist of high standing in the diocese.

What "The Church Times" thinks of the Scheme. "Some weeks ago (May 25) we set forth in outline in our leading columns 'An Educational Policy for Churchmen,' mainly on the lines of a scheme which had been introduced to the notice of Luton Deanery by Mr. Ellery, a well-known teacher and old member of the N.U.T. We are glad to see that he has introduced his scheme to the notice of the Ely Diocesan Conference, of which he is a member. We are still more glad to find that Mr. Ellery met with a great deal of support, especially from so sound an authority as Canon Stokes, late diocesan inspector, who moved and carried that the Conference should express its sympathy with the principles laid down, and refer the details of the scheme to the Diocesan Council of Education."

The Higher Elementary Schools Minute. It is quite clear that schools which have in the past taught specific subjects will teach them—for the present, at any rate—without payment. This will operate harshly in many cases, and especially with those voluntary schools which have striven to give their senior scholars instruction in the more advanced subjects, such as French, algebra, mensuration, etc., etc.

School Boards also have a grievance. Take London, for example. The School Board asked for the recognition of seventy-nine of their higher-grade departments as higher elementary schools under the Minute. "My Lords" refused! "With reference to the application.....the Board of Education did not consider that the establishment of so large a number of higher elementary schools in London alone would be consistent with the intention of the Minute. That intention was that higher elementary schools should be open to only the most highly qualified scholars who would be likely to continue their education throughout the whole four years' course of instruction, and that a higher elementary school should be furnished to that end in every case with well-equipped laboratories, as in the case of existing schools of science." Unfortunately, the London School Board, instead of sending a unanimous protest against this interpretation of the Minute, settled down to the discussion of whether the School Management Committee should be empowered to apply for the recognition of a smaller number than seventy-nine. The resolution was not carried, for Dr. Macnamara promptly moved the previous question, and was successful by twenty-nine to fifteen. Still the figures will convince the Board of Education it may safely interpret the Minute to the exclusion of at least some of the best London schools.

TECHNICAL AND SECONDARY EDUCATION.

"The Education Act, 1900." SUCH is the short title of the long-expected Bill which was to bring order out of chaos so far as relates to secondary education. Its full title is, "A Bill intituled an Act to make better provision for enabling County Councils and other Local Authorities to aid forms of Education not being elementary." It has but eight clauses, with sub-clauses. It provides for the whole of the Local Taxation (Customs and Excise) money being devoted to education. The effect of this will be that about £60,000 a year will go to education, instead of to the relief of the rates, as at present. The money is to be administered by the council of the county, or the county borough, through a committee constituted in accordance with a scheme made by the council, and approved by the Board of Education. Consequently, the constitution of the committee may vary in every county and county borough. It is optional with the council whether they will appoint any outsiders on the committee or not. The committee is denied the power of borrowing, raising a rate, or spending more money than is allowed them by the council. Neighbouring councils may unite to elect one committee, and make such provision for carrying out the work as may seem necessary; and the schemes may be altered from time to time as the councils think fit. The Board of Education has power to step in if the council does not act within twelve months.

The second clause provides that the money raised by a rate shall, after due provision has been made for technical education, be applied to any other kind of education (presumably not elementary). The money to be raised by rate shall not exceed twopence in the pound. This is double the amount allowed under the Technical Instruction Act, 1889.

Clause 3 defines the kind of aid which constitutes a school an aided school, and declares that no preference shall be given to a school because it does or does not belong to a particular denomination, or because religious instruction is or is not given in the school. Aid may be given to private adventure schools, and the term education in the Technical

Instruction Act is to have the wider signification referred to in the title of this Bill.

Councils must report to the Board of Education as the latter may require, and they must have regard to existing interests when contemplating the aiding or the building of new schools.

If an existing school feels aggrieved, the governing body may complain, and the council must comply with any order made by the Board of Education respecting the complaint. Certified industrial, day industrial, and reformatory schools are expressly excluded from the operation of the Act. In Wales, the county governing body is to take the place of the committee under the Act.

It will be seen that the Bill does nothing new in the matter of organisation, but that it simply recognises existing authorities, and gives them leave to spend a penny more in the pound than at present, and power to aid schools with a classical curriculum—Latin and Greek, according to Sir John Gorst, being the only subjects excluded by the Technical Instruction Act.

The Shortcomings of the Measure. 1. It fails to grapple with the problem of the local authority. It leaves the local council absolute freedom in its choice of representatives; and although freedom, variety, and elasticity may be all very well in forming a school curriculum, if the new committee is not to be a homogeneous one, the Bill should provide for the representation of existing interests of all classes of education. The primary school authorities may, under the Bill, be entirely ignored.

2. Its power to aid is greatly restricted by the inadequate financial proposals.

3. It does not bring us a step nearer to the "one sole authority" which Sir John Gorst yet hopes to see, "responsible to the people and possessing the confidence of the people, which will arrange the whole educational system, elementary and secondary." On the contrary, it will render the establishment of such an authority more difficult than it is now.

It is understood that the Bill is not intended to pass this year. That being the case, it will be well to secure such an expression of opinion as will cause considerable improvements in the Bill when re-introduced in 1901.

The Consultative Committee. Following quickly upon the heels of the Secondary Education Bill came the announcement of the appointment of the Consultative Committee. It numbers eighteen, and consists of Mr. Acland and Sir William Hart Dyke (two former vice-presidents of the Education Department), Sir William Anson, M.P. (Oxford University), Sir Richard Jebb (Cambridge University), Professor Armstrong (the apostle of the heuristic method of teaching), Mrs. Sidgwick, Mrs. Bryant, and Miss Manley (Representatives of University, Secondary Schools, and Training College for Women respectively), Sir Michael Foster (science, and London University), Dr. Gow and the Hon. and Rev. Edward Lyttelton (Nottingham and Haileybury Public Secondary Schools), Mr. Henry Hobhouse, M.P. (County Councils), Dean Maclure (Association of School Boards), Mr. Humphreys Owen (Welsh Intermediate Schools), Archdeacon Sandford (Voluntary Church Schools), Dr. Waller (Training College and Wesleyan Schools), Professor Windle, M.D., and Mr. Ernest Gray, M.P. (Elementary Teachers and Schools).

It will be seen that university and secondary schools largely monopolise the representation, while elementary education comes a long way behind. In preparing a register of teachers, in advising as to inspection of schools and the creation of local authorities, in advising as to the unifying of often antagonistic authorities, in securing facilities for training all classes of teachers, the Consultative Committee—composed of representative persons, six of whom had experience on the Royal Commission—will find ample scope for doing a great work for education. There are some names which we should gladly have seen included, and more especially should we have been pleased to see a much larger proportion of members representing the 60,000 certificated teachers of the country. The members are appointed for six years, one-third to retire every two years, but to be eligible for re-election.

The Board of Education and Higher Elementary Schools. The Board of Education, in its interpretation of the Higher Elementary Schools Minute, is woefully lacking in its estimate of the needs of localities, and the desire of the people for education beyond the possibilities of an elementary school. London has seventy-nine higher-grade schools, and the London School Board desired to place all these under the Minute. The Board of Education, however, seems willing to recognise only the four schools of science; and London, where the need for the higher elementary school is certainly not the least, is to be at the bottom of the list of all the large towns in its provision for the needs of the people. A vigorous, and, it is hoped, an effective protest has been made against the limitations thus placed upon the action of the School Board.

The Board of Education and its Officers. The tripartite division of the work of the Board of Education has not found favour in the eyes of the President, the Duke of Devonshire. It seems to have been impossible—as those who were fully acquainted with what was being done in the country saw from the first—to separate the technical from the secondary part of education. In view of the fact that above eighty per cent. of secondary schools lay themselves out to give scientific and commercial and in some cases technical training, as well as a general education, the decision arrived at is, after all, the most sensible one. And although it may be said that the principal assistant secretary has hitherto had little or no experience of the working of secondary schools, the appointment of the late secretary to the Royal Commission on Secondary Education, the Hon. W. N. Bruce, will make up for that deficiency. The officers of the Department are Sir George Kekewich, Permanent Principal Secretary; Mr. John White, Principal Assistant Secretary for Elementary Education; Sir William Abney, Principal Assistant Secretary for Secondary Education, with the Hon. W. N. Bruce, Assistant Secretary on the literary side, and an assistant secretary for the technological side, not yet appointed.

The great mass of secondary teachers are disappointed that Mr. Sadler has not been appointed to the post now occupied by Mr. Bruce, but we believe that it will be found that there is still more important work to be done by him in the office of Director of Special Inquiries, which he now so ably fills.

EDUCATION IN SCOTLAND.

E.I.S. NOTES, ETC.

BY JAMES PATERSON,

Ex-Vice-President of the Educational Institute of Scotland.

Northern Counties Schoolmasters' Association. The annual conference of the Northern Counties Schoolmasters' Association was recently held in the Elgin Academy. Mr. Steel, Nethybridge, presided. Mr. John M'Lennan, rector of Elgin Academy, gave an address on the teaching of languages, in which he pointed out that many teachers were not fully qualified for the work they undertook. As regards the question of capricious dismissals, a motion condemnatory of the proposed Departmental certificate, and suggesting the substitution therefor of provision for an appeal, was unanimously agreed to.

Labour Certificate. The result of the abolition of the school examination for the labour certificate has exceeded expectation. The Clerk to the Glasgow School Board states that the numbers remaining at Glasgow schools beyond the fifth standard in October last were 30 per cent. greater than in the previous year, and, although there had been throughout the session an unusual diminution in attendance owing to epidemics and other causes, the higher classes at the end of the session were 29 per cent. larger than last year. The effect in many other parts of the country is said to be similar.

Callander Dismissal. Since the meeting of the Callander School Board at which the dismissal of the head-master of

the M'Laren High School was resolved upon, three members of the Board have resigned, in accordance with the request of the ratepayers in meeting assembled. Now that there is not a quorum in office, the Scotch Education Department will probably take the matter in hand, and order a new election, when the ratepayers will have an opportunity of giving expression to their views regarding the dismissal.

The Catterline Case. Another evident injustice has been perpetrated in the dismissal of the head-mistress of the Catterline Episcopal School, and the following resolution thereanent has been unanimously adopted:—"That the Kincardineshire Branch of the E.I.S. is of opinion that the action of the managers in dismissing the head-mistress of the Catterline Episcopal School was unjustifiable and capricious: the Branch condemns such action, and urges upon the Education Department the advisability of providing some means whereby such dismissals may be averted."

Tenure of Office. Sir John Gorst has recently said that security of tenure is essential to teachers, and that it is an inevitable legislative product of the near future. In the discussion of the Education Estimates, several speakers specially emphasised the need for protection against the caprices of small school boards, and of practically irresponsible managers, without eliciting one word of dissent; and the Vice-President endorsed and accepted that view of the matter by declaring that security was "inevitable."

Lord Balfour's Bill. In a circular issued by the Educational Institute, local committees are requested to communicate with the members of Parliament for their various districts, urging upon them the utter inadequacy of the provisions in Lord Balfour's Bill to meet the demands of teachers for protection against arbitrary and capricious dismissal, and calling upon them to support an appeal either to the Scotch Education Department or to the Higher Education Committees. There is understood to be little reason to hope that the Bill will pass during the present session, the rating clauses having given rise to such an amount of opposition that the Bill is likely to find a place among the slaughtered innocents.

The New Method of Inspection. In discussing the new method of inspection, Mr. Whyte, H.M. Inspector, unhesitatingly expresses his preference for the new order of things. The visits without notice have been to him a great pleasure, and in all these visits he has found the teachers toiling as diligently as it was possible for mortals to do. The instruction, he observes, has already begun to gain a breadth and a breeziness which are refreshing. The conversations about the working of the school and the methods employed are, in Mr. Whyte's opinion, good both for teacher and inspector. The latter, he remarks, now sees schools in their workaday garb, and has a better means of realising the peculiar difficulties under which the work is carried on.

Garioch Branch, E.I.S. The Garioch Branch of the E.I.S. lately enjoyed their annual excursion, the place chosen on this occasion being Huntly. The retiring president, Mr. James Taylor, Drumblade, gave an address on the work of the association and educational matters generally. Speaking of the new Code, he said teachers were now placed in a position to regard their scholars as children, and the school as a place of pleasure. The Education Bill before Parliament he considered generally satisfactory, but education, primary and secondary, should, in the speaker's opinion, be placed under one governing body. Teachers of all ranks should, he thought, join the Institute. At a subsequent social meeting, the retiring secretary, Mr. Ritchie, Port Elphinstone, was presented with a drawing-room clock and side ornaments, in recognition of his twenty-one years' service to the association in that capacity.

Needlework. In a circular to school managers, the Scotch Education Department states that no instruction in needlework is satisfactory unless it includes practical lessons in cutting out and fixing. It is found, Sir Henry Craik says, that the teacher frequently does this work herself, whereas her assistance should only supplement, not take the place of, the children's own endeavours. The attention of H.M. Inspectors has been directed to this matter, and they have been instructed to see that the requirements of the Third Schedule as to "cutting out and fixing" are carried out in their entirety.

The Teaching of Arithmetic. Mr. Walker, one of H.M. Chief Inspectors of Schools in Scotland, in his general report for 1899 remarks on the teaching of arithmetic that there is too much working by rule, and too little application of reason and common sense; too much practice in long, complicated, useless sums, and too little inculcation of principles. Above all, he says, there is great need of increased practice in mental arithmetic, and this should include much more than short methods of finding prices of dozens and hundreds, and the like. What is wanted is promptness and accuracy in adding, subtracting, multiplying, and dividing small numbers; and the teaching of every new rule should begin with mental exercises exhibiting all possible cases of it with the smallest possible numbers.

The Training of Teachers. *The Saturday Review*, in an article on teachers in elementary schools, says that their education has been a scandal—so much so that it is very doubtful if the advantages of the new Code can be made to tell till we have a differently and better trained set of teachers. Cramped from babyhood in the swaddling-clothes of subjects, standards, and examinations, the bands tightening as they rise through the stages of pupil, pupil teacher, and training college, and not relaxed on their return to school as qualified teachers, how can they use the freedom now open to them?

NOTES FROM THE NORTH.

The Scottish Class Teachers' Association. We have been favoured with a copy of the Annual Report of this Association; and, from a careful perusal of its contents, it is evident that much good work is being done by this youthful Association. It is a pity that so much of it is given up to the discussion of salaries; but that, we fear, in the present condition of affairs, is perhaps inevitable.

The membership shows an increase of 29 as compared with last year, so that it now stands at 3,576. The reasons for the small increase are given as "continual migration in rural centres, owing to insecurity of tenure, to lack of political and social status, and to want of prospect, both as regards remuneration and preferment."

From the reports of the various secretaries of the different branches, it would seem as if good work was being done in many directions, both educational and professional.

With reference to salaries, one secretary writes: "The old Board would do nothing towards a scale of salaries, but was compelled to raise the initial salary of male assistants to £90, advertisements at a lower figure producing no response. The new Board is to be approached immediately." And with some of the daring characteristic of our brethren south of the Tweed, he adds: "Until a general scale with a fair maximum has been adopted, this is a Board to be avoided." Another reports: "Salaries have been increased in one or two districts, but this has been brought about mainly by the supply and demand."

"One Board here," says a third, "has no scale, and is now paying £100 as a commencing salary. This Board suffers much from changes of teachers. The teachers, seeing no prospect of a fair maximum, go to Boards having scales. This Board should be avoided."

The Federation Council's Report is very interesting reading, as showing the objects the Council has kept before it during the year. We cull a paragraph or two from it:—

"For years the Federation Council has strenuously exerted itself to secure better remuneration and improved status for class teachers, and there are not wanting numerous and unmistakable indications that the work performed with this aim in view is having the results its promoters anticipated.

"The facts and figures collected by the Council and laid before the public appear to have convinced parents that the chances of their sons and daughters obtaining even a

respectable income in the profession of teaching are by no means assured, while the opportunities of attaining to a position of importance may be set down at something like 1 in 210.

"Consequently, Boards are gradually finding it necessary to hold forth better pecuniary inducements in order to secure the services of adequately qualified teachers. Notwithstanding the fact that in many places the minimum salary has been considerably raised, they are discovering that years of niggardly treatment have brought about the elimination of candidates of approved scholarship and ability."

The English class teachers will be interested to know of the points in their Merthyr Conference which struck the Scottish representative. In his report to the Council he referred to the following—(1) the great enthusiasm of the English teachers in their Association and its work; (2) their difficulties in *re* C.P. regulations; (3) the great dearth of male and also of female trained teachers; (4) the fact that many of the most prominent officials of the N.F.A.T. had left the profession for business life; (5) the close bond between the N.U.T. and N.F.A.T.; and (6) the amount of discussion over the influence of the clergy in educational affairs.

The report winds up with an urgent appeal to non-members. "The great problem that now confronts our Association," it concludes, "is how to reach the apathetic and pessimistic, how to arouse in them a higher ethical conception of their professional responsibilities, how to get them to grasp the fact that their nonchalance and aloofness are the chief, we might say *the* obstacles, which impede the forward movement."

FOREIGN NOTES.

BY B. E. FOURNIER D'ALBE, B.SC., A.R.C.S.

THE Annual Congress of German teachers took place at Whitsuntide this year at Cologne, the capital of Rhineland. This occasion, as one of the delegates observed, was the first on which the Rhine had been bridged by German educationists. The joy of life and *gemüthlichkeit* which is almost inseparably associated with the Rhine seems to have pervaded the entire assembly of three thousand delegates. Among the subjects actively debated were technical education and the teaching of domestic economy. Some strong opposition seems to exist to the general introduction of "hand and eye" training; but the instruction of girls in domestic economy, however it may withdraw attention and energy from the main objects of school teaching, was regarded as a necessary evil in industrial centres. An educational exhibition was one of the features of the Congress.

* * * * * *

When this issue appears, the educational congresses in Paris will be in full swing. July 24 to 28 is fixed for foreign languages. July 30 to August 3 are set apart for social science and for university instruction, the latter subject being debated in the appropriate location of the Sorbonne. From July 31 to August 6 we have a congress on secondary schools, and August 2 to 5 a congress on elementary education. This important congress will also sit at the Sorbonne. Tickets, at 3 francs, are to be had from M. Marguery, 36 Boulevard Bonne Nouvelle. There will be five sections, dealing respectively with domestic economy, school attendance, moral instruction, higher elementary schools, and adult schools. All information will be supplied by M. Trautner, 20 Rue Étienne Marcel. Papers on any of the above subjects can be announced up to August 1 in the case of foreign visitors.

* * * * * *

We need hardly add that the Paris Exhibition, to which congress members are admitted free, furnishes a liberal education in itself. The French Republic takes a special pride in its system of education. The French elementary school may not be ideally perfect, but the *école supérieure* is acknowledged to be the best of its kind. The system of *laicisation* has been carried through logically, one might almost say ruthlessly. The educational results have, outwardly at least, shown much progress. The Exposition itself aims at being a great school, working by the method of objective presentation and comparison. And it must be freely acknowledged that, in one department at all events, it exceeds anything ever before presented; and that is the department of fine arts. A day spent in the Palais des Beaux Arts gives the visitor a marvellous insight into the state and triumphs of modern art.

* * * * * *

In the matter of "higher elementary" education, Austria has of late years made rapid progress. The old distinction between the elementary school and the "citizens' school" (*Buergerschule*) has entirely disappeared. The latter is now simply a continuation of the former. The elementary school comprises a course of eight years, and the *Buergerschule* a further course of three years. In the former, children of all classes are instructed side by side. This is all the more surprising as the last generation witnessed a bitter antagonism and class prejudice between the two schools, which, at the same time, had practically the same functions and programme. The present system appears to work very well, apart from certain sectarian difficulties. It is now to be extended by adding another year to the curriculum of the *Buergerschule*, and granting full graduates a reduction of the term of military service to two years.

* * * * * *

Education in the French colonies is not organised on the cast-iron system which obtains in France. Administratively, the four "old colonies" of Martinique, Guadeloupe, Réunion, and French India are similar; but whereas the first three are largely Gallicised, the latter is as Tamil as ever it was. The small islands named are inhabited by people who speak a kind of French *patois*, which it is made their first duty to forget on going to the French school. But even at the present time Pondicherry, Carikal, and the other small French possessions in India contain practically no natives capable of freely conversing in French. The number of pupils has more than doubled within the last fifteen years, and is now about ten thousand, costing about £1 per head per annum. All race and caste distinctions have been abolished in the schools, and European and Eurasian, Mohammedan and Hindu, are treated to the same educational nutriment.

* * * * * *

Statistics of the mortality of the various professions show a remarkable prevalence of diseases of the respiratory organs in the case of teachers, and, strange to say, most of all in the case of rural teachers, probably on account of the inferior ventilation in rural districts. Taking the total population as a basis, the mortality of teachers at ages of from twenty-one to forty-five comes out as 84·6 per cent., whereas that of doctors is 125·9, according to some statistics published by the *Allgemeine Deutsche Lehrerzeitung*. Town teachers in South Germany die a good deal of cancer. The mortality of Catholic priests is far in excess of that of Protestant clergymen.

* * * * * *

The Madras Government has abandoned the Gains of Learning Bill, which was so strongly protested against as tending to break up the unity of the Hindu family. This concession to popular sentiment has been received with universal satisfaction.

Indispensable to Scholarship, Certificate, and London Matriculation Students.

ABOUT'S LE ROI DES MONTAGNES.

With Notes, Exercises, and Complete Vocabulary.

PRICE TWO SHILLINGS.

THOMAS NELSON & SONS, 35 and 36 Paternoster Row, London.

UR·CLASS·ROOM·AIDS·

NOTES OF A LESSON ON THE DOG.

By WILLIAM DONE, B.A., *Head-Master, Brighton Pupil Teachers' School.*

Articles of Illustration.—The diagram accompanying this month's PRACTICAL TEACHER, and, if possible, a docile dog, to be handled by its owner.

HEADS.	MATTER AND METHOD.
I. The picture examined.	The children have always a strong liking for dogs. The teacher will at once secure the interest and sympathy of the class by asking which children have dogs at home, whether those dogs are similar to any depicted on the sheet, etc.
1. *Kinds of dogs.*	
(*a*) *Newfoundland.* (*b*) *St. Bernard.*	Probably the two dogs which the class will desire to talk about first will be the Newfoundland and the St. Bernard, both on account of their size, and also because of their intelligence and docility. They have read stories of Newfoundland dogs saving people from drowning, and of St. Bernard dogs rescuing travellers in the Alps.
(*c*) *Deerhound.* (*d*) *Greyhound.*	The deerhounds and greyhounds might be compared with the two former kinds. Like them, they are tall dogs, sometimes between two and three feet high; but their slender bodies and thin, long legs show how they are especially adapted for running.
(*e*) *Bloodhound.* (*f*) *Foxhound.*	The bloodhound might next be pointed out, and the reason of its name elicited. The foxhound could be similarly dealt with.
(*g*) *Collie.*	This dog will be familiar to country children as a sheep-dog; perhaps it is the most intelligent of all dogs.
(*h*) *Bulldog.*	The common bulldog, the mastiff, and the terrier are all of the same family. Ask what idea is implied in the term British bulldog applied to an Englishman.
(*i*) *Spaniel.*	Note the long, wavy hair of the spaniel. The bulldog is a large spaniel.
II. Inferences from the above preliminary observations, and additional information.	
1. *Body.*	The body of the dog is somewhat long for its size, and might be compared with that of the cat. The loins are thin and the chest large. These facts are very noticeable in the greyhound, and distinguish these animals as those which should catch their prey by fleetness.
	The covering of hair should be noticed on the live dog exhibited to the class; it should be contrasted with the furry coat of the cat.
2. *Legs.*	The legs are evidently formed for running. They are thin, long, and muscular.
3. *Paws and claws.*	Let the owner of the dog point out its toes to the class.
	Five toes are on the fore foot, and four on the hind foot. Notice the fifth toe, which never reaches the ground. Note, also, that the two middle toes are of the same size, and longer than the two outer ones.
	Taking the dog round the class, let the paws and claws be examined, and hence elicit that it has pads like the cat, but that its claws are blunt, and cannot be drawn back into a sheath like those of the cat, and probably this is the reason of the bluntness.
	Let the dog walk about the room a little, while the children look and listen in perfect stillness. It is evidently a toe-walker like the cat, but we can hear its claws scraping along the ground.
	The cat moves silently, because it pursues its prey by stealth; the dog, as we noticed before, runs its prey down.
4. *Tail.*	An examination of the picture will show that the tail of the dog is usually long, and curved gracefully at the end. Sometimes the tail is short and stiff. This will be seen if a Scotch terrier is shown to the class.
	A little questioning of the children, or experimenting on a suitable dog in front of them, will show the readiness with which the animal will exhibit its feelings by means of its tail.
	Delight will be expressed by wagging the tail; fear or shame, by the tail hanging between the legs.
5. *Head.*	Note the pointed shape of the head, whereas that of the cat is round. This fact is well seen also in the diagram of the skull.
6. *Teeth.*	Let the owner of the dog open its mouth. Note its great size and consequent use.
	It has three different kinds of teeth—cutters, tearers, grinders.
	Give the dog something to eat. Observe that he bites, but does not chew his food as we do. Point out, also, how well developed the tearing teeth are. Let a child show the corresponding teeth in its own mouth, and give their name—dog-teeth, or canine teeth.
	Refer to the tenacity with which a dog will hold on to any article which it seizes.
7. *Tongue.*	Let the owner of the dog, or any child, hold out his hand for the dog to lick. Ask if any one has felt the cat licking his hand. Compare the two: the dog's tongue is wet, soft, and smooth; while that of the cat is rough, fitted to rasp off particles of food from bones, etc. Elicit, also, that the dog's tongue is frequently seen hanging out of its mouth. This is because it perspires through its tongue, and not through the skin, as a whole, as we do.
8. *Ears.*	The ears vary greatly in size, as may be noticed in the picture. Observe, by means of the dog exhibited, how acute the sense of hearing is; note the pricking up of the ears. The longer the ears, the longer period of time has the particular breed of dog been domesticated.
9. *Eyes.*	The eyes are large and round, but do not vary in size as much as those of the cat do.
10. *Sense of smell.*	Refer to the way a dog usually walks, with its nose pointed to the ground. It traces its food chiefly by means of this sense. Refer to the employment of bloodhounds in following a track by the scent.
III. Habits.	Elicit how fond men are of dogs. The horse and the dog are two of the most useful servants of mankind. Dogs are noted for their fidelity to their masters, as well as for their intelligence. The class will be ready with plenty of tales to illustrate these characteristics.

THE INSPECTOR'S NOTEBOOK.

BY AN INSPECTOR OF SCHOOLS.

BOARD OF EDUCATION'S SPECIMEN SCHEMES.

"The schemes are merely suggestions, and it is hoped that teachers will exercise their own discretion freely upon them."—*Explanatory Memorandum.*

HAVING dealt with the time-table under the new Code, we will now pass on to the consideration of the official specimen schemes. Copies of these schemes can be procured *gratis* upon application to the Board of Education. No stamp is needed on your letter of application, so that the question of expense does not come in at all. And yet, only the other day, I came across two head teachers, with schools under the new Code, neither of whom had seen these specimen schemes. I grant you that much musty literature has been issued from Government offices; but the Board of Education's recent publications are invaluable. My first advice then is, to procure these specimen schemes and carefully study them.

Conferences of the Staff. When the head teacher has studied and thought about them, he should call together his staff and confer fully with them about the schemes. Of course I am referring to the large schools now. There is no reason why every teacher—assistant as well as head—should not have a copy of the schemes. These conferences of the whole staff are excellent arrangements. If the assistant is to take a lively interest in his work, he must be brought into friendly contact with the head, be allowed plenty of freedom in methods, and have responsibility devolved upon him.

The Explanatory Memorandum. Coming now to the actual schemes, we may briefly notice the important items of the explanatory memorandum:—

1. The schemes are intended as guides to teachers, and merely as suggestions.
2. Liberty of classification and of choice of methods of instruction are to be the watchwords for the future.
3. At the same time there need be no rapid or violent changes, as in many large schools probably little alteration will be necessary.
4. Greater changes will be possible in the smaller schools, where there should be more subjects and less detail.
5. It is expressly stated that no addition to the teacher's work, "already sufficiently arduous," is to be required.
6. Changes should be made gradually.

The Schemes—History. There are eleven specimen schemes given, and one or the other should be found suitable as a basis for every school in the country. Nevertheless, it is quite possible that there may be some teachers unable to fit in their schools with any of these. If any such will write to me, I will gladly help them. Please give the average attendance, kind of school, rural or urban, nature of surroundings, industries, and staff. I have already been consulted respecting the History, probably because this seems to be an extra class subject. Now, in all schools History is intended mainly for the elder scholars only. Teachers who wish to give instruction in History to the lower classes can, of course, do so. Personally, I think it advisable to begin in Standard III. with a few interesting and simple tales—one lesson a week. In the upper standards the time given will vary with the teacher. My advice to the teachers of small schools is to be careful to get a really good historical reader (two sets to use in alternate years would be better). Let the children use this reader in the reading lesson once a week, and you should give at least one oral lesson bearing upon this lesson. You should select a reader which deals generally with the history from the time of the ancient Britons down to the present time. Too much time should not be devoted to the earlier periods. The great point is to avoid detail, as there is no time for it. In the large schools, beginning with Standard IV., I should make the instruction fairly general. Select, say, twenty-four stories from the whole period rather than from, say, the period ending with the Plantagenets. I prefer this to teaching by compartments, wherein the scholars get very distorted notions of the whole. The history, too, should be taught with the geography wherever possible—the linking of subjects being always borne in mind.

More subjects—less detail. In the explanatory memorandum we read, "But if the scheme of lessons is made more comprehensive, the lessons in each branch of learning need not include such minute detail as when fewer subjects were studied." We can understand this better by reference to the schemes. Take the English, for instance, in Scheme I. "Reading from suitable reading-books (to be changed from year to year). Copy-book writing and transcription. Formation of easy sentences, both orally and on paper." Here we have what would, under the old Code, appear as no less than five subjects—reading, handwriting, spelling, composition, and grammar. It is only necessary to compare this scheme with the old schemes in these subjects to see the force of the above remarks about more subjects and less detail.

Composition. We must notice the importance that appears to be attached to composition from the beginning. Language, both written and oral, is to be given a higher place in the curriculum. This is following the lines of secondary schools, where correct speech has always received special care. In the past there has been too little time for teaching children to speak politely and correctly. And yet what is education without this? Verily we are on the brink of mighty changes. If we can only refine our children in speech and action, it will be worth more than all the marvellous feats of the past in the percentage line. In the upper standards there should be plenty of variety now in the written composition. The suggested syllabus runs: "Reproduction of passages read by children, letter-writing, written descriptions of simple objects discussed in object lessons." Briefly, the changes may be rung upon the following:—

1. Description of objects placed before the class.
2. Reproductions—(*a*) of an object lesson or a geography lesson; (*b*) of a story; (*c*) of passages read in the geography or history lesson.
3. Letter-writing.
4. Accounts of places visited or of sights seen.
5. To rewrite an unpunctuated passage, correcting all errors and putting in all stops.

Arithmetic and Geography. There is very little new in the arithmetic syllabuses. The old syllabuses will probably serve as guides for some time to come. They will be found to be logically arranged. There is an agreeable change in the geography—at any rate for Standard I., where it is now possible to get along without all that wearisome business of charts, plans, scales, and weathercocks. Note in Scheme IV. for large town schools, Class VII. (old Standard I.), "Elementary notions." We shall have more interesting work for the future here. In the upper standards the study of the geographical reader is recommended. It will be very necessary to select a well-written and interesting reading-book.

Common Things. It is when we come to the Elementary Science and Common Things that we notice important changes. 1. In the first place, we note that every school will be expected to give instruction in this subject. 2. This course is to be suitable to the locality. 3. Boys and girls in mixed schools, though receiving the same instruction in the lower classes, are, if such is more suitable for them, to be taught different courses in the upper classes. (See Scheme III.) It is in this subject that the rural schools will be able to develop curricula calculated to benefit the children in after life, and to instil a love of country life so as to stop the great influx into the towns. Wherever possible, practical work of some kind should be done by the elder scholars, and even some of the other lessons may be taken in the fields and by the hedgerows—notice having been given to the inspector.

NOTES OF TWO LESSONS ON THE FLOW OF A STREAM.

(As recommended by Circular 369: Water No. 3.)

By WILLIAM DONE, B.A., *Head-Master, Brighton Pupil Teachers' School.*

Articles of Illustration.—A basin with some water, a large glass jar with sand and pebbles of varying sizes, a clay model to show inequalities in the bed of a river, pictures and diagrams.

LESSON I.

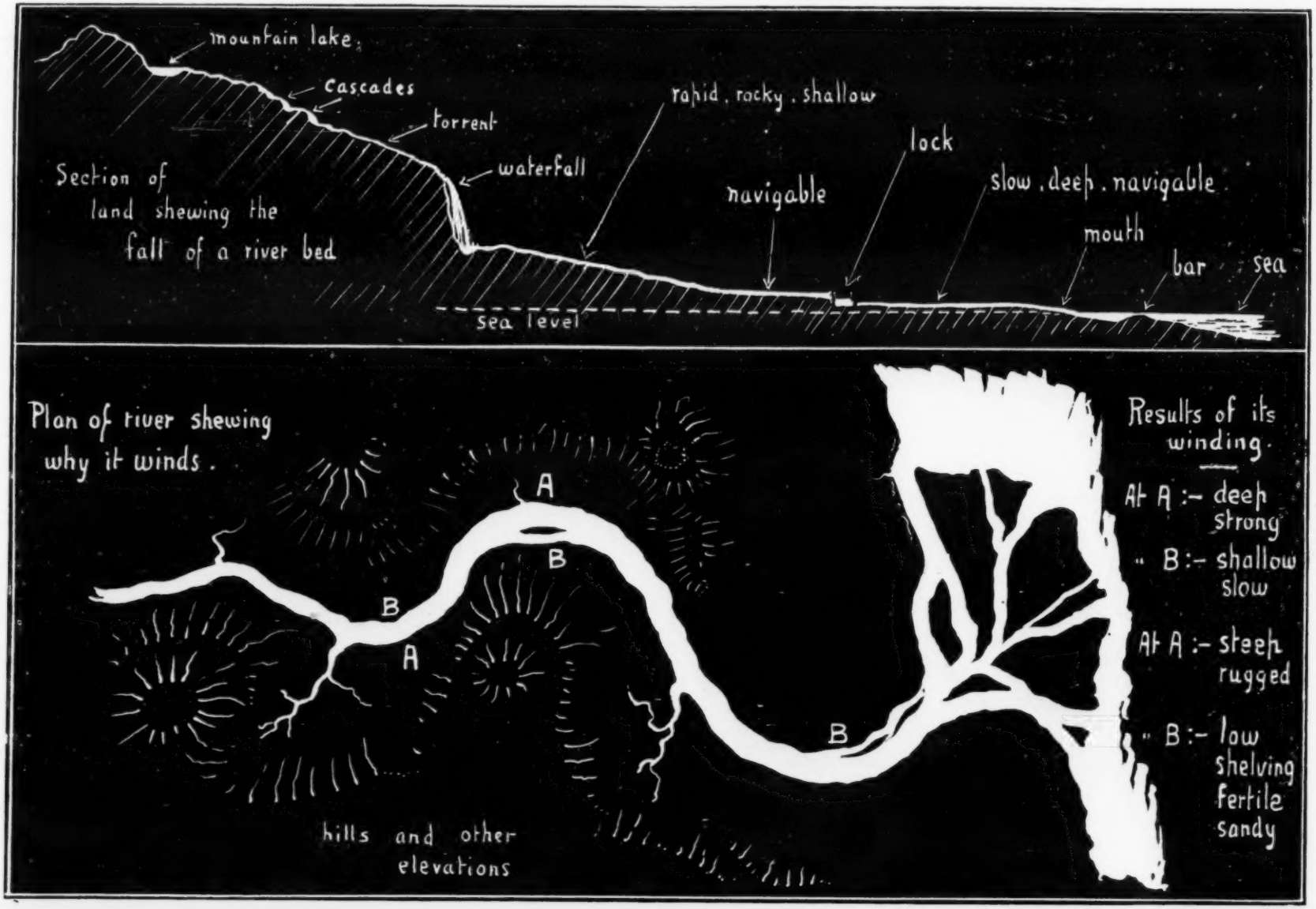
HEADS.	MATTER AND METHOD.
I. Preliminary out-door study.	If there is a good stream within easy access of the school, the first lesson might with advantage be given out of doors. The work could be commenced from a bridge, where the varying depth of the water might be tested by means of a weighted piece of string. The rate of flow could be arrived at by dropping a cork into the water on one side of the bridge and noting the interval of time which elapsed before it appeared on the other side of the bridge. It could also be ascertained in the same manner that the flow of the stream was quicker in the middle than at the sides. If a good view were obtainable from the bridge, one could perhaps notice that the stream gradually widened in the direction of the flow; its winding character might also be observable. A walk along the bank round a bend would show where the bank was eaten away and where the sand was spread out, and might reveal shallows and sandbanks in the water. Notice might be given that very shortly the lesson would be resumed in the school, and that in the meantime the children should find out further facts for themselves, which would be of help on the occasion of the formal lesson.

LESSON II.

HEADS.	MATTER AND METHOD.
I. The flow of a stream.	Pour some water into a basin. The water is at rest. Compare with a pond. Tilt the basin: the water flows. Compare with the outdoor observation of the stream. Show the course of a river on a picture and on a map. At one end we have the high ground where the river commences; at the other end we find the level sea. The course of a stream is therefore along sloping ground, and the amount of the slope will affect the rate of flow of the water in it.
II. Where the flow is quicker. *(a) In the middle.*	We noticed that the current of the stream was quicker in the middle than at the sides. We found out also that the water was deeper in the middle than at the sides. The shallow water at the sides rubs the ground over which it flows, and is thus retarded or hindered in its course, while in the middle the upper layers of water glide over each other with hardly any friction.
(b) The outer side of the bend.	While we walked round the bend of the stream, we saw that the bank on the outer side of the bend showed signs of wearing away—of being scooped out, as it were; while on the other side we saw an accumulation of fine sand, forming a good bathing-place. As the stream hurries on in its downward course, when it passes a sharp bend the rush of water is directed towards the outer edge of the curve, and so continually rubs away the bank on this side. The water near the opposite bank is comparatively quiet, and allows the sand to settle down and accumulate. One bank being thus constantly hollowed out and the other silting up, we can understand how in the course of ages the bed of a river slowly changes.
III. The varying bottom.	If possible, a clay model should be made exhibiting on an exaggerated scale the inequalities in the bed of a river. Some of these inequalities may also be elicited. In the outdoor lesson we noticed shallows and sandbanks; some of the children would probably know of deep holes favourable for fishing purposes. The effect of an abrupt fall in the bed of a stream may be illustrated by a picture of a waterfall.
IV. Confluence of tributaries.	Attention should again be directed to a map or picture of a stream. The main water course, with all its inflowing smaller water courses, looks like a tree with its numerous branches. The junction of the main stream with one of its tributaries is called the confluence, and very frequently sandbanks will be noticed at these points.
V. Depositions at the mouth of a stream: delta.	Place in the glass jar some pebbles, sand, and mud. Gently pour in some water: it at once mixes with the mud and becomes discoloured. Refer to stirring up the bottom of a stream with a stick. Shake the jar gently: the sand becomes also mixed with the water; whilst a more vigorous operation will cause the pebbles themselves to be set in motion. Set the jar at rest: the small stones settle at the bottom, the sand slowly subsides; but the water must be perfectly still before the mud settles and leaves the liquid clear above. Call attention to the shapes of the various pebbles which were obtained from the river-side walk. Many of them are found to be of quite different material from the ground in the immediate neighbourhood of the part of the stream visited. Moreover, while most of the pebbles are rounded and smooth, others are inclined to be angular, more like a broken piece of rock. Evidently the smooth pebbles have had all their corners worn down. Suppose the stream far up its course had loosened a piece of hard rock so that it fell into the water: it would sink to the bottom, but it would not remain there; the flowing water would roll it along, and as it rolled and rubbed against other stones the pointed corners would be rubbed away, until it presented the appearance of a water-worn pebble. One might again notice the water in our glass jar. It is sure to be a little clearer; more of the mud has settled. When the water of the stream in a similar way comes to rest by entering the still waters of a lake, or by flowing into the sea where there is little or no current, the same kind of thing happens. The largest stones first come to rest, then the smaller ones in their varying degree, the lightest substances, as mud, being on the top. Such a deposit, constantly increasing, forms what is known as a bar, and then becomes a marshy piece of land, obstructing the course of the stream, and causing it to divide and run on each side of the deposit, leaving a triangular space of land between. Such a piece of land is called a delta. Various well-known deltas could be referred to, such as those of the Nile and Ganges.

BLACKBOARD ILLUSTRATION.

BY C. ARMSTRONG, EXAMINER TO DEPARTMENT OF SCIENCE AND ART.



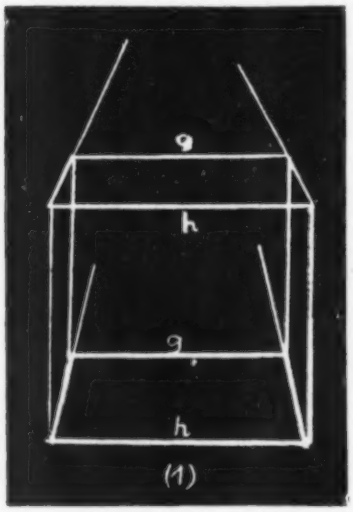
BLACKBOARD DRAWING.

COMMON OBJECTS.

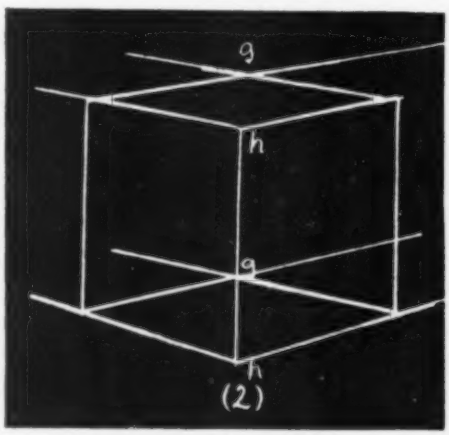
BY EDITH E. BAMFORD, ART TEACHER, EDGE HILL TRAINING COLLEGE.

IV.

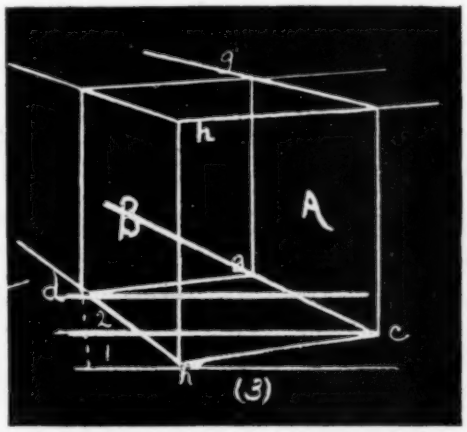
THE syllabus gives the following directions: "Students should be able to sketch rapidly some common objects from memory..... As a rule, forms should be represented in outline only, all unimportant details being omitted from them."



It is supposed, in this and the following article on sketching common objects, that the student has already had training in elementary model drawing. Generally, however, such training is confined to the sketching of geometric models only, and the application of the principles to other objects has not been considered; also there has been no training in memory drawing. The result is that the first attempts to sketch even the simplest com non objects from memory are often failures.



The objects to be sketched for a lesson are usually of very simple form: for instance, many required for experiments in chemistry—a box, tank, collecting jar, thistle tube, etc.; and simple forms of this kind should not be beneath one's notice in the first drawing practices. Later, the apparatus arranged as for experiments will make more difficult subjects. Again, many of the objects are of geometric form, so that a knowledge of how to apply the principles of perspective, learned in model drawing, will ensure a fairly accurate result. The skill required in the freehand drawing for sketching long, flowing lines is not so necessary here, as the lines are generally either straight or make only simple curves.

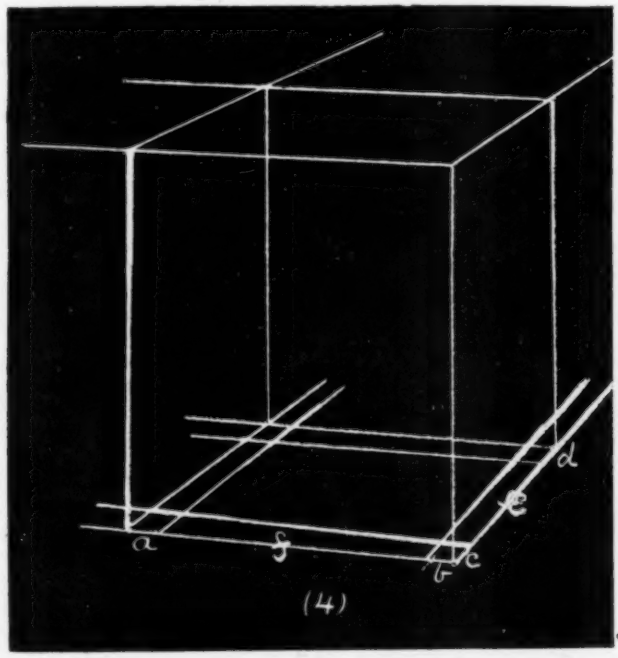


It is best in the first exercises to select objects most nearly resembling geometric models and to memorise them, then gradually to proceed to others of more varied form and greater detail. Thus, exercises based on the principles of the cube, square prism, cylinder, cone and ring, which so frequently give the ground form of common objects, should be practised. Such exercises will be most helpful to the student when memorising and learning to apply the principles of perspective, and they form a very important branch of his training in the illustration of lessons.

Here are three general rules for practising from such objects:—

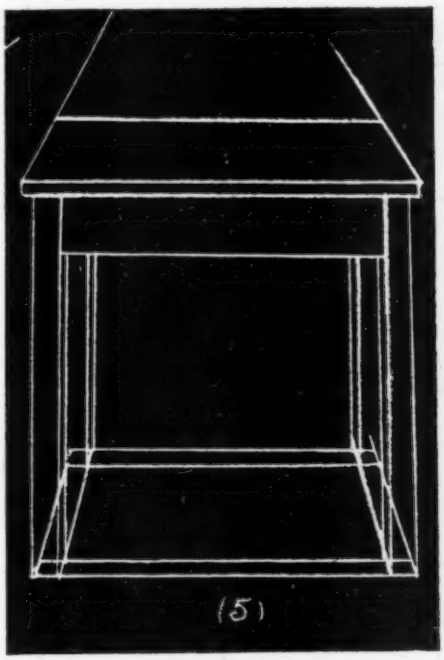
1. Sketch a geometric model similar in form to the object selected and placed in various positions, in order to analyse the perspective.

2. Sketch the general outline of the object, placed in the same positions as the geometric model, until it is memorised.



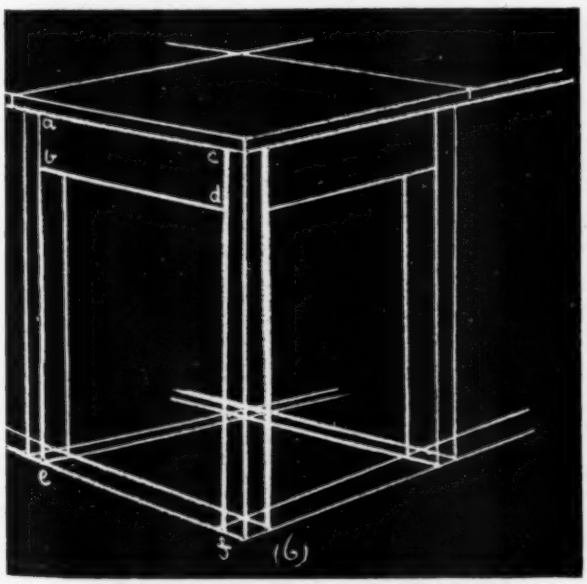
3. Elaborate the details when the difficulties of the per-

spective and the general form have been overcome. Do not, however, wish to add detail before the ground form has been thoroughly understood.

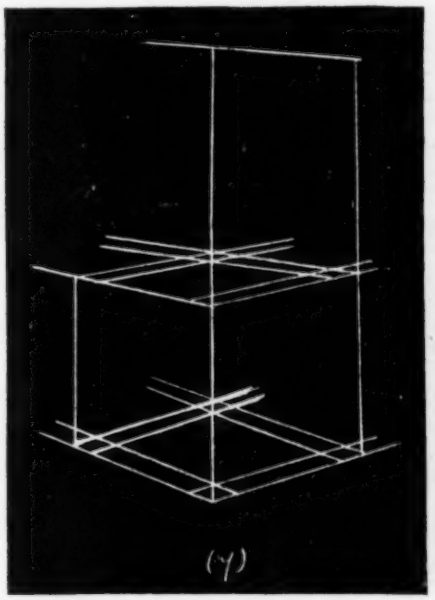


A few examples, based on the principles of the geometric models, will now be considered.

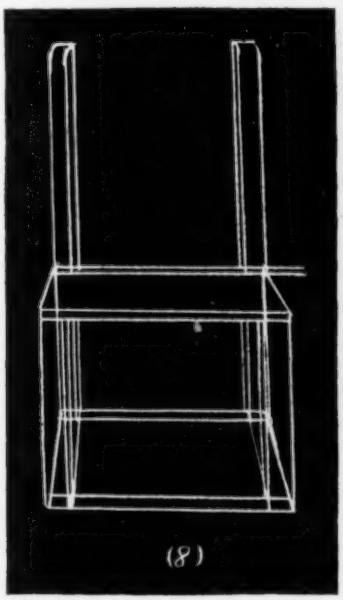
I. *The Cube.*—Make a series of drawings of the cube in various positions and on a large scale, and analyse the perspective. Notice particularly in the sketches similar to those



shown here (Figs. 1, 2, 3):—1. The greater slope of the base lines, and the resulting greater depth of the bottom face, from *g* to *h*, as compared with the top face. 2. Side A (Fig. 3) is more nearly the true shape of the face—namely, a square—than B. 3. Point *d* is approximately twice the height of *c* (Fig. 3). This is due to the fact that all the vertical faces of the model are of the same size; but in the sketch, side B is only half the size of the front face, therefore side B must be vanishing twice as much from the spectator as the front face, and so *d* is twice the height of *c*. This proportion of slope determined by the proportionate width

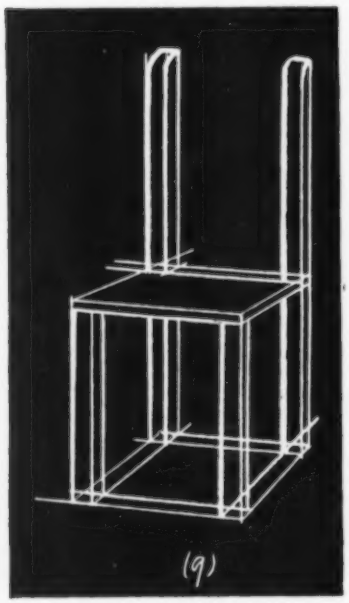


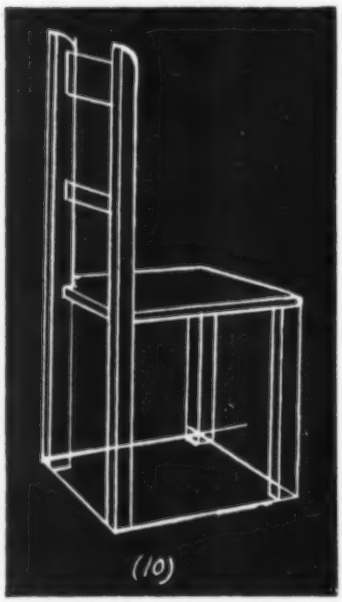
of the faces in the sketch, when all the vertical faces of the model are of the same size, is not absolutely correct, but it is approximately so, and it will prevent much more serious mistakes being made in the perspective of the cube when sketching it from memory.



Next sketch from a model which is similar in form to the cube, and which has little detail—for example, a square table—and notice that the general rules are the same in both cases. If the legs are square, first obtain the perspective of the feet by marking off on the front line and one side line spaces to represent the width: *c* and *d* (Fig. 4) must be smaller than

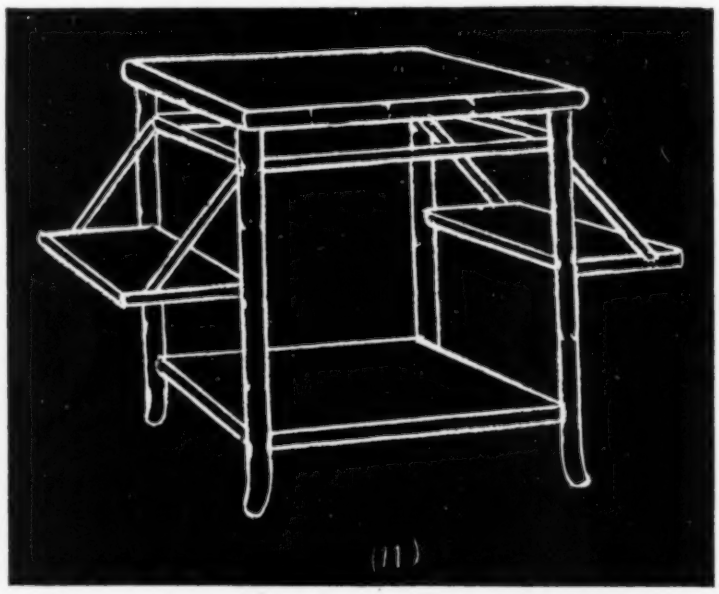
a and *b* in the same proportion as line *e* to *f*. Produce lines from the points thus obtained to mark off proportionate spaces on the back and the other side line, and the perspective of the feet will be approximately represented. Attention should be paid to the sketching of the overhanging top and the strip of wood underneath: *a b* should bear the same proportion to *c d* as *a e* does to *c f*. These latter points will serve to illustrate a very general principle in sketching the common objects—namely, that when once the perspective of the general outline has been obtained, the perspective of the details can easily be found by marking off proportionate parts on this outline. Of course the principle is the same as that of making all parallel lines converge to the same vanishing point; but in practice it is found that more accurate results are obtained, and the perspective is more quickly found, by considering the proportion of space rather than the convergence of lines. Perpendiculars from the three points of each foot nearest the spectator should be erected, to complete the legs.

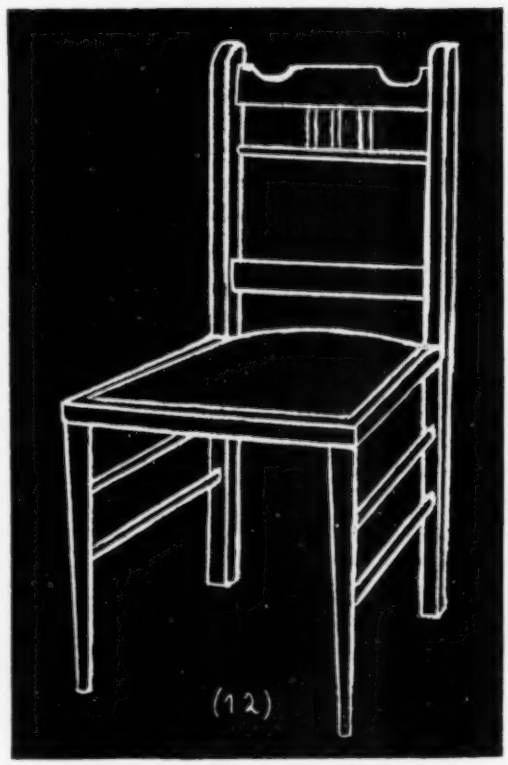

(9)


(10)

The chair is sketched in the same way as the table, but two of the legs are produced to form the uprights of the back. The way in which these fit on to the seat should be carefully examined. Squares sketched on the seat, similar to those for the feet, and in the same proportion (Figs. 7, 8), will give the points at which the uprights come above the seat. The bars across the back should mark off the same proportion of space on the two uprights (Fig. 10).

The two last sketches (Figs. 11, 12) show modifications of the table and chair, with more elaborate detail. Other objects based on the principles of the cube, and with simple or elaborate detail, should be practised; and after such practice there should be no difficulty in sketching any object of cubical form from memory before a class, with fairly accurate results. If the objects are not quite cubical, as a rule they may be sketched as if they were perfect cubes, and so the difficulties of the perspective will be diminished.


(11)


(12)

BOTANICAL NOTES FOR TEACHERS.

BY PROFESSOR J. R. GREEN, SC.D., F.R.S.,

Late Examiner in Botany to the University of London, and to the University of Cambridge;

AND F. L. GREEN,

Late Science Mistress in the Clifton High School.

SCHEDULE A. 1, B. 1. *Thalictrum* (*Meadow Rue*).

THERE are several species of *Thalictrum*. The Alpine meadow rue is only found on the mountains of Wales and Scotland; the sand-dune meadow rue occurs on sandy seashores, the hill meadow rue in stony places, the yellow meadow rue along the banks of ditches and rivers, the greater meadow rue in damp, bushy, and stony places, especially in the north. The characteristics of this genus are—sepals four to five, petaloid, imbricate; petals, none; carpels without tails, few, each containing one ovule. The natural order is Ranunculaceæ—herbs with a watery, acrid juice, conspicuous flowers, indefinite hypogynous stamens, and free carpels. Type plant the buttercup. Familiar plants of the order are—clematis, anemone, globe flower, monkshood, columbine, marsh marigold, pæony, and larkspur.

SCHEDULE A. 1, B. 7. *Daisy* (*Bellis perennis, Chrysanthemum Leucanthemum*), *Yellow Goat's Beard* (*Tragopogon pratense*), *Feverfew* (*Matricaria*), *Chamomile* (*Anthemis*), *Milfoil* (*Achillea millefolium*).

The daisy is "the eye of day" (Chaucer), closing at night and opening at dawn. It may easily be distinguished from the ox-eye daisy by its conical receptacle, and its having more than one row of ray florets. There is a good description of *Bellis perennis* in Evans's *Botany for Beginners*, p. 265. Notice especially the flowers. They are arranged in a capitulum or head. The disc flowers are incomplete but perfect, actinomorphic, tubular, and minute. The ray flowers are incomplete, imperfect, zygomorphic, ligulate, and minute. The calyx is absent in both disc and ray flowers. There are two united inferior carpels. The pollination is by means of insects, and both cross-pollination and self-pollination takes place. (See Evans, p. 266.) The ox-eye daisy is said to be destructive to fleas.

The yellow goat's beard, or Jack-go-to-bed-at-noon, is a tall glaucous plant, with large yellow flowers that close at noon. The pappus, or circle of hairs representing the calyx, is feathery, on a long stalk, and interlaced so as to form a kind of shallow cup. The fruit is beaked, and has longitudinal ridges. It is a common plant in meadows and waste places.

The feverfew (*Matricaria*) have no pappus. The corn feverfew is an abundant plant in fields, flowering from June to October; the sea feverfew is found in the north of Scotland. The wild chamomile is frequent in cornfields. The three plants are alike in having their leaves much divided into narrow segments; bracts imbricate, in few rows; receptacle broad, naked, becoming conical after flowering; the ray florets in one row, ligulate, white.

There are several species of the true chamomile (*Anthemis*)—the bright yellow ox-eye chamomile, found in fields; the white stinking chamomile, common in waste places; the corn chamomile, frequent along the borders of cultivated fields; and the common chamomile, plentiful in gravelly and sandy places. The chamomiles are strongly-scented herbs, with bipinnatifid leaves, solitary heads, a scaly receptacle, ray florets in one row, ligulate, oblong, pappus represented by a membranous ring.

The name milfoil is given to two distinct plants—the common yarrow (*Achillea millefolium*), which is said to have the property of healing wounds, and the water milfoil (*Myriophyllum*). The former plant has very tough angular stems; the leaves are bipinnatifid, the leaflets cut into hairlike segments; the heads small, white or pink, in dense terminal corymbs.

All these plants belong to the great natural order Compositæ, easily distinguished by its flowers being in heads, and its stamens syngenesious. It contains many garden plants—for example, the sunflower, chrysanthemum, cineraria, marguerite, gaillardia, calliopsis, dahlia, Jerusalem artichoke, chicory, and lettuce.

SCHEDULE B. 2. *Charlock* (*Brassica Sinapistrum*).

The charlock, or wild mustard, is a very common weed in cornfields. It is a hispid plant, with rough lyrately-pinnatifid leaves; sub-corymbose, bright yellow flowers; and spreading, linear, many-angled, constricted siliquæ. It is a crucifer or crosswort, the flower having four petals arranged in the form of a cross, and tetradynamous stamens.

SCHEDULE B. 3. *Catchwort, Silene, the Lesser Stitchwort.*

Several species of catchfly are rather uncommon weeds. The bladder campion is a very abundant weed, and is easily recognised by its many drooping panicled flowers, scented at night. The calyx is inflated and bladderlike, with a network of veins, the petals white and deeply cloven.

The lesser stitchwort is *Stellaria graminea*, common in dry, heathy places. The sepals are united in a conical tube; the styles three, the capsule six-valved; the very deeply-cleft petals are scarcely longer than the three-veined sepals. The foliage leaves are sessile, very narrow, acute, ciliate.

Both plants belong to Caryophyllaceæ, herbs with stems swollen at the nodes; leaves opposite and simple; sepals and petals five; stamens ten, free, in two series; placentation axile. Evans, *Botany for Beginners*, p. 252, is good on the order.

SCHEDULE B. 4. *Meadow Sweet* (*Spiræa Ulmaria*), *Dropwort* (*Spiræa Filipendula*), *Herb Bennet or Avens* (*Geum urbanum*).

The meadow sweet, or queen of the meadows, is a very pretty plant, abounding in moist places. The leaves are interruptedly pinnate, white and downy beneath, the terminal leaflet very large and lobed. The creamy-white, fragrant flowers are arranged in densely-crowded, erect, compound cymes; sepals four to five; carpels five to twelve.

The dropwort has a short rhizome and nodulose rootlets; the leaflets are cut into narrow serrate segments; the flower cymes are pink in the bud, white when open. It is found in dry pastures on a limestone soil.

The common avens, or herb bennet, is found in almost every hedge and thicket. Notice the persistent, jointed, hooked styles. The flowers are yellow.

These plants belong to the natural order Rosaceæ, readily known by its regular flowers and perigynous indefinite stamens. Plums, cherries, apricots, peaches, nectarines, apples, pears, almonds, raspberries, strawberries, quinces, and medlars all belong to this order.

SCHEDULE B. 5. *Melilot* (*Melilotus*), *Clover* (*Trifolium*), *Bird's-foot Trefoil* (*Lotus*).

The common yellow melilot (*Melilotus officinalis*) has a scent not unlike that of new-mown hay. The small yellow flowers are arranged in long erect racemes, and the pods are compressed, ovoid, acute, hairy, black when ripe, and one to two seeded.

There are several species of clover (*Trifolium*). The red clover (*T. pratense*), the crimson clover (*T. incarnatum*), and the white clover (*T. repens*) are the best known. They all have many-flowered spikes of papilionaceous flowers. In the red clover the throat of the calyx has a ring of hairs, and the pod is one-seeded. Crimson clover has a cylindric spike. In white clover the flowers are axillary, and the pod is four-seeded.

The common bird's-foot trefoil is a pretty common flower. The papilionaceous flowers are borne in umbellate cymes, five to ten together, on long peduncles and very short pedicles, generally deep orange in the bud, and varying in the same umbel from bright yellow to deep brownish-orange. The legumes, which are about an inch long, diverge like the toes of a bird.

For the natural order Leguminosæ, *Object Lessons in Botany*, p. 143, makes the sweet pea the type plant. Evans, *Botany for Beginners*, p. 255, takes the garden pea. The order is easily known by its papilionaceous flowers, and the fruit of a single carpel dehiscing along with the ventral and dorsal sutures (legume). Useful plants belonging to this family are the broad bean, scarlet runner, garden pea, medick, saintfoin, vetches. Evans has a good drawing of bird's-foot trefoil, *Botany for Beginners*, p. 257.

SCHEDULE B. 6. *Chervil* (*Charrophyllum*), *Hemlock* (*Conium maculatum*), *Water Hemlock* (*Cicuta virosa*), *Dropwort* (*Œnanthe crocata*).

The chervil is a very common plant in woods and hedges. It has a stem spotted with purple, deeply lobed and cut bipinnate leaves which turn purple in the autumn, and terminal drooping umbels of white flowers. The fruit is shortly beaked and contracted at the side, and the ridges are blunt.

The hemlock has a slender, perfectly smooth, furrowed stem spotted with red, smooth, finely tripinnate leaves and white

flowers. It is easily recognised by its fœtid smell, and is extremely poisonous.

The water hemlock (*Cicuta virosa*) is a very poisonous plant with white flowers. It grows along the side of hedges and ditches. The stem is an underground rhizome. The leaves are large and tripinnate, and the narrow and lanceolate leaflets are also tripinnate.

The water dropwort grows along the edges of ditches and in marshes. It is often mistaken for celery. The root fibres are about as thick as the thumb. The stem is from two to three feet high, thick, branched, and grooved, and the petioles sheathe the stem throughout. Cows are often poisoned by eating the roots.

For the natural order Umbelliferæ, Farmer, *Practical Botany*, p. 217, takes the cow parsnip as the type plant; and *Object Lessons in Botany* has a good lesson on hogweed. (See also Evans's *Object Lessons in Botany*, pp. 262–4.) Useful plants are the carrot, turnip, parsley, celery, fennel, caraway, coriander.

SCHEDULE B. 8. *Figwort* (*Scrophularia*).

The figwort (*Scrophularia*) was formerly used as a medicine for scrofula. It gives its name to the natural order Scrophularineæ. Herbs with zygomorphic flowers, gamosepalous five-lobed inferior calyx, gamopetalous five-lobed hypogynous calyx, didynamous stamens, and syncarpous pistil, with axile placentation; fruit a capsule. The foxglove is taken as the type plant in *Object Lessons in Botany*, pp. 145–8, and Evans, *Botany for Beginners*, p. 272. Foxglove and eyebright are used in medicine.

Farmer, *Practical Botany*, pp. 234–7, compares with the figwort the toadflax, musk, foxglove, eyebright, yellow meadow rattle, cow-wheat, and veronica. The figwort grows by the side of streams and ditches. The flowers are almost globular, and of a brownish-paper colour. The stems when dead become very rigid, and are a great trouble to anglers owing to their lines becoming entangled in the withered capsules.

SCHEDULE B. 9. *Comfrey* (*Symphytum*).

The common comfrey (*Symphytum officinale*) is a large and handsome plant that grows by the side of rivers and in watery places. Farmer, *Practical Botany*, p. 229, takes it for the type plant of Boragineæ; Evans, *Botany for Beginners*, takes the water forget-me-not. The natural order Boragineæ consists of herbs with succulent hairy stems, entire leaves, and scorpioid cymes of actinomorphic flowers. The style is gynobasic, and the fruit consists of oval indehiscent nutlets. The floral formula is K (5) [C (5) A 5] G (2). The dried root of alkanet, a plant belonging to this order, is used in medicine.

OUR ILLUSTRATED GEOGRAPHICAL NOTEBOOK.

CHINA.

CHINA has long been a disturbing element in the politics of the whole civilised world; for the possible break-up of an ancient empire of immense area, and containing a quarter of the population of the entire globe, presents a problem sufficient to puzzle the keenest diplomatists of the age.

The present imperial form of the Chinese government was certainly in existence before the Christian era, and there is a written history dating back two thousand years before the birth of Christ. In the early years of the sixteenth century the Portuguese visited Canton; the Dutch and the Spaniards followed; and, nearly a century later, the English began to claim a share of the few trading facilities. The Chinese have always adopted a most uncompromising attitude towards foreigners, and the trend of events seems to point to the fact that the feeling is no less pronounced at the present time.

In 1792 the first British embassy proceeded to Pekin. In 1816 our representatives were summarily dismissed with the utmost contumely, because the ambassador would not perform certain servile prostrations which the Chinese government demanded.

War broke out in 1840 in connection with restrictions placed upon the opium trade, the net result of which was the opening of Canton, Foo-choo, Ning-po, Amoy, and Shanghai to commerce, and the cession of Hong-Kong to Britain. A second war caused five other ports to be opened; and these have been added to at intervals, until the number of open ports has reached thirty.

Not only did the Chinese repel all attempts at intercourse on the part of foreigners, but their own subjects were not allowed to go beyond the limits of their own empire. In this respect public opinion underwent a radical change positively alarming in some quarters of the globe. The trade of the Straits Settlements is now very largely in the hands of the Chinese settlers, and there are hundreds of thousands scattered throughout the Eastern Archipelago. The Australian colonies have probably 100,000, and British Columbia 20,000; but the imposition of a heavy poll-tax has reduced immigration to these portions of our Empire. For years the Chinese settled in the United States at an astounding rate. Commencing with 3,000 per annum, it rose steadily to 30,000 in 1882. Prohibitive measures became absolutely necessary,

and in 1888 the immigration of Chinese workmen was forbidden for a period of twenty-one years.

The Chinaman is not an ideal colonist. Many of his habits are unsavoury. He will work for a wage upon which white men could scarcely exist; and his one aim is to secure a competence with which to return to the "Flowery Land." The appearance of the Chinese in any considerable number in any part of the world, in competition with white labour, has become known as the "Yellow Peril," and the economic aspect of the question alone is fraught with difficulty.

In recent years it has become quite evident that the government of China is unequal to the task of controlling some four hundred millions of people, the vast majority of whom are in China Proper: Tibet, Eastern Turkestan, Mongolia, and Manchuria do not possess more than twenty millions. The whole country seethes with rebellion, and the court is a hotbed of intrigue and duplicity. At the present time the Emperor is a prisoner at the instance of the Dowager Empress, whose power again has been usurped by Prince Tuan.

Secret societies permeate the whole national life of the people, and of these the "Boxers" are probably the most anti-foreign and anti-Christian. The occupation of Kiachau by the Germans originated this society, which has gathered strength from the sympathy if not actual indorsement of its views by some of the authorities, if not by the Dowager Empress herself.

A Grand Council of eight members assists the monarch in dealing with the affairs of the empire; but a special body, called the Tsung-li-yamen, pretends to deal with foreign matters. Its ten members possess no real power. They never decide anything but the most trifling business; but

as a means of raising obstacles or postponing Western demands, they are a striking success.

It must be borne in mind that whatever differences the Chinese may have among themselves, there is a solid and common hatred of the foreigner and everything pertaining to him. Much of this feeling is due to ignorance of Western methods and purpose, but it is a factor to be reckoned with all the same. Only as recently as last November the *North China Daily News* protested against the satisfactory reports of the safety of travelling in China constantly disseminated by more or less irresponsible travellers. Armed with the most favourable credentials, flying visits to a few of the chief commercial cities afford no criterion of the real state of the country. Under such conditions Chinese officials are courtesy itself. Ordinary merchants and missionaries in the interior find that the hatred of the populace is little disguised, and outrage and even murder frequently pass unpunished.

Recent events prove that the warning was necessary. In May the Boxers, aided by regular troops, massacred all the Chinese converts to Christianity on whom they could lay hands; the legations at Pekin have since been cut off; and the commandant of the Taku forts opened fire on the foreign warships. Prince Tuan initiated a scheme for destroying the representatives of the Powers, which encompassed the death of the German ambassador only. The allied forces of the Powers destroyed the Taku forts, and at once commenced measures for the relief of the legations. At the time of writing all is uncertainty; and what the outcome of the trouble will be, it is difficult to forecast.

Various nations appear to think they have vital interests at stake in China. What are the real facts? Of the total annual trade, £69,000,000, the British Empire takes 64 per cent., Japan takes 11 per cent., United States 9 per cent., Russia less than 5 per cent., and France and Germany still less. British trade is first, and that of the other Powers is infinitesimal in comparison.

What policy is most compatible with our vast commercial interests? We require no extensions of our territory, but desire to see a stable government with sufficient power to afford increased security and facility for commerce. If this can be established and maintained, China need not fear being parcelled out among the various interested nations.

The fighting strength of China is small in comparison with the population. Since the Japanese War, only a few vessels remain in the navy. The regular army at its full strength numbers about 1,000,000; but behind this force is the "mob," the strength of which depends on the degree to which the anti-foreign sentiment is roused. It will take a considerable time to collect an allied force sufficient to cope with the outbreak; but when this is done, the Boxers and the anti-foreign element generally will be taught a stern lesson, and the government will be placed on a basis more in accord with the true interests of China and all who have dealings with her.

PRACTICAL ELEMENTARY SCIENCE.

AN EXPERIMENTAL COURSE COVERING THE REQUIREMENTS OF BOTH THE DAY AND EVENING SCHOOL CODES IN PHYSICS AND CHEMISTRY.*

BY THOMAS CARTWRIGHT, B.A., B.SC.,
Author of "Practical Chemistry," "'Section One' Physiography," etc.

Evaporation.—The interesting work that can be done in this connection has the one drawback that it takes time; but this can be met by sandwiching the experiments requiring time between those that can be more expeditiously performed. For example, the first step in studying evaporation should be to weigh a saucer, or, better still, an evaporating dish, and then to pour in some water until the vessel is about three parts full, and then to weigh again, whereby the weight of the water is ascertained. The vessel is then exposed to the air, and is weighed periodically—say once a day—until the whole of the water has gone, the amount lost being recorded both graphically and in milligrams, etc. The qualitative part of the experiment—that is, the exposure to the air—should be performed by every student, without exception, at home.

Another experiment bearing on this point is the seaweed experiment. A muslin bag is filled with seaweed and is exposed to the atmosphere, preferably by being hung in a box, one side of which is open to the air. The bag is periodically weighed, just as in the case of the saucer of water, the difference being that the bag will weigh sometimes heavier and sometimes lighter, according to the condition of the air with respect to moisture. The points to elicit are—(1) that **the air absorbs moisture**;-(2) that **the hotter the air the better it absorbs**; (3) that **cooled air deposits water.** The disappearance of the water from the saucer ought to suggest the first point; and reference to (*a*) the drying up of puddles, (*b*) the drying of clothes, (*c*) cloud formation, etc., should provide ample corroboration. The morning moisture on the window pane, and its subsequent disappearance when the room is warmed, as well as the formation and dissipation of morning mists, should be referred to under (2) and (3); and especially should the precipitation of clouds as rain be alluded to as an experiment performed by Dame Nature in proof of condensation. The action of heat in promoting absorption by the air naturally leads up to the rapid evaporation due to boiling. An excellent observation lesson is offered by the study of the boiling of water in a flask, with a thermometer to indicate the various temperatures up to boiling point. It should not be difficult for an intelligent student to discover for himself the characteristic of boiling or ebullition—namely, the vaporisation of some of the water within the bulk as well as from the surface, as in the case of evaporation pure and simple. The holding of a slate or other cooled surface over the escaping vapour will illustrate condensation, and it will be very profitable to spend some little time in drawing from the pupils an explanation of this simple and well-known fact. The class will now be ready to study **condensation** and the **still.** All that will be required for each group or individual will be a retort, a flask, a tripod stand, a source of heat, and some blotting-paper. The retort is placed with its bulb on the tripod and with its beak in the flask, which should rest in a vessel containing cold water, and be covered with the blotting-paper. Heat is applied to the retort, and, as soon as the steam begins to pass over, the flask is kept cool by the constant application of cold water to the blotting-paper. Water soon begins to collect in the flask, and the converse processes of evaporation and condensation should now be studied until the pupil has observed well the various stages. The apparatus should also be carefully understood, the main idea to grasp being that it is a combination of a **boiler** and a **cooler**, to which the name **still** (Latin, *stilla*, a drop) is given, for reasons that should be obvious from the observation of the collection of the water drop by drop in the cooled receiver. The receiving flask will be made so hot by the incoming steam as to render it difficult for the application of cold water to the blotting-paper to keep it cool enough for much water to be condensed. Advantage should be taken of this fact to (1) further impress upon the students the action of cold in bringing about condensation, and (2) to introduce the Liebig's condenser, the action of which should be apparent to every one of the pupils who has properly understood what has preceded. If it is desired to study further the process of boiling, the Franklin experiment may be performed by every boy with profit. This consists in boiling a flask, the bulb of which is about half filled with water, and, just allowing the boiling to cease, to cork the flask with a well-fitting cork, to invert it, and to pour cold water upon the bulb. The paradoxical boiling of the water by the application of *cold* water to the bulb always excites interest, and a little skilful questioning may suffice to elicit that the cold water condenses the steam within the bulb, and so diminishes the pressure upon the surface of the water, which **boils because of the diminished pressure,** although it is much cooler than when it ceased boiling. Mention of the enforced boiling of vegetables in a Papin digester, say on Mont Blanc, would lead nicely up to the

* Books referred to in this series of articles are published by T. Nelson and Sons.

fact that boiling is the overcoming of the pressure of the atmosphere, and that the greater this pressure the higher the boiling point, and *vice versâ;* but this is not strictly a part of our course, nor is the connected study of latent heat.

Residues after Boiling.—Evaporating basins, or, better still, clock glasses containing (1) rain-water, (2) tap-water, (3) sea-water, should be heated until the whole of the water disappears, after which the question of what is left, and why it is left, has to be discussed and settled by the students, as it is one well within their power to solve. By far the best way to evaporate the water is by heating it on a water bath—that is, an arrangement whereby the temperature shall not rise above the boiling point of water, and so obviate the risk of driving off any volatile solid that may be in solution. Such a water bath may be easily extemporised from a saucepan with a tin lid. All that is needed is to cut holes in the lid, in which the clock glasses or evaporating basins just fit. Upon boiling the saucepan the clock glasses will be raised to the boiling temperature of water, and the water contained therein will gradually evaporate without incurring the risk of which mention has just been made. To show that this is a reliable way of determining the weight of solid matter contained in solution by a liquid, a clock glass is weighed, and water is poured in it, to which is added a weighed amount of salt, sugar, soda, or other easily-dissolved substance; and evaporation to dryness is accomplished as before, after which the watch glass and the residue contained by it are weighed, when the weight will be seen to be that of the glass plus the salt, etc., that was added. Reference should now be made to the fact that large metal condensers are used by steamers now to separate the salt, etc., from sea-water to make it fit for drinking purposes; and practical illustration of this may be made by distilling some salt water in the Liebig condenser, which water should be tasted by the students, who will probably remark upon the flat, insipid character of the taste. An explanation of this taste, as due to the absence of air, may be given by the teacher, or may perchance be got from an intelligent student, and the practice of seamen in running the water from one vessel to another in order to aerate it may appropriately follow; but this again is somewhat of the nature of a digression, and may be omitted where time presses. It should be pointed out that the *double process* of evaporation and condensation, as performed in a still, is known as *distillation*, and that distillation is a very useful and highly-valued method of separation, not only of solids from liquids—as exemplified in the salt water experiment—but also of liquids from liquids; to prove which statement a mixture of linseed oil and water might be distilled, and the distillate be shown to consist of water. In order to explain why the water should come over, and not the oil, the boiling points of the two liquids might be ascertained by heating them in a flask with a boiling thermometer, when it should be apparent that the easily-boiling water comes over before the oil is hot enough to boil.

Filtration.—The mention of pure water would easily lead up to the consideration of filters and filtration, and the following experiments should then be performed. Ordinary filter papers or pieces of blotting-paper cut round should be folded in halves and then in quarters, after which they are opened in such a way as to have three thicknesses on one side and one on the other, whereby a paper filter funnel is made. This should be placed in a glass filter funnel, or, failing this, may be used without. Water containing solid matter, such as lime, in suspension, is run through the paper filter, and the filtrate is caught in a vessel, and upon examination is shown to be free from suspended matter, so that filtration is a means of separating solids from liquids in which they are suspended. The next experiment is even more interesting. Glass filter funnels are filled with animal charcoal, a substance cheaply and easily procurable. Through these funnels, charged with charcoal, are run liquids containing colouring matter in solution, such as a solution of brown sugar, water coloured with blue litmus or ink. Upon issuing from the funnel the liquids are found to be colourless, so that the solid charcoal has filtered the liquids free from colouring matter. Further, the pupils may be told that noxious gases contained in water are also got rid of by this simple process of running them through a filter made of solid carbon. It will give further point to this part of the course to show the application of this to the purification of sugar, which is passed through animal charcoal, as in our experiment, in order to produce white sugar from the brown syrup obtained from the sugar-cane; and that the muddy waters of rivers, such as the Thames and the Lea, are made palatable by straining them through a series of filters in the shape of beds of sand at different levels, whereby the mud and other solid matter held in suspension is detained, and the water is purified in other respects; and finally a carbon water filter may be examined, and may be compared with a home-made flower-pot filter provided with layers of fine sand, coarse sand, fine gravel, and charcoal placed in the order named, the charcoal being at the bottom of the flower-pot. (See *Domestic Science*, pp. 157–9, Thomas Nelson and Sons, 2s.)

ELEMENTARY LESSONS IN THE PRINCIPLES OF GRAMMAR.

A Course of Forty Oral Lessons for the First Year (New Code, Standard IV.).

BY JOHN R. TIMSON, B.A.

LESSON XXX.

MOOD.

THE temper or disposition of a person varies with circumstances. Thus, mother is pleased when we do right, and angry when we do wrong. Then she will praise or blame us accordingly. When pleased, we can say that she is in a pleasant mood or humour, and when angry, that she is in an angry mood or humour.

A speaker expresses his mood in his language chiefly by the tone of his voice, but there are certain moods which are indicated by the form of the verb.

1. If a person is confident that what he says is true, feeling sure and certain that he is stating a fact about which there is no doubt, he *indicates* his confident mood in his language, and the verb is said to be in the *indicative* mood. The twelve tenses you have already learned are in the indicative mood.

2. If the speaker merely *supposes* what he has to say, or is *in doubt*, or if he puts it forward as a *condition* of something else occurring, his assertion will be in the *conditional* mood, as—If I *go*, you can stay.

This mood is generally shown by the conjunctions "if," "lest," "except," "unless." As it is generally *subjoined* as a condition of the principal assertion, it is also called the *subjunctive* mood.

3. If a speaker is imperious, and commands something to be done, the verb is said to be in the *imperative* mood. As the speaker commands the hearer, the imperative mood is always in the second person. The hearer is not usually named, but "thou" or "you" is understood—that is, "thou" or "you" is thought, not said.

Go away.

Go.....Imperative mood, agreeing with "thou" or "you," understood.

We must remember that "thou" is singular, and that "you" is plural.

4. If a speaker regards an action without attaching it to a subject, he names the action with the word "to" before it. "*To play* is pleasant." "To play" marks the action without limiting it to a subject. The true verb, as indicating an assertion, must have a subject, and the verb may then be said to be finite—that is, having its limit in that subject. The verb without a subject is said to be in the infinitive mood. It is really a noun, being the name of the verb.

To exercise is healthy.

To exercise...Infinitive mood, naming the action as subject.

I like *to play*.

To play...Infinitive mood, naming the action as object.

Tom runs.

"Runs" is asserted only of Tom, and is limited by Tom. It is therefore *finite*.

To run is pleasant.

"To run" is not limited to a subject. It is not finite. "To run" is in the infinitive mood.

"Finite" means "limited to a subject." "Infinitive" means "not finite."

A gerund or verbal noun may be used instead of the infinitive mood:—

Running is pleasant.
He likes playing.

Other moods of a speaker are indicated by separate verbs—for example, "can," to denote power or ability; "must," to denote necessity:—I *can* go. I *must* do it.

These will be noticed in another lesson.

The moods illustrate the true nature of the verb as being the word of the speaker. In all other words we look to things or their attributes, but in the verb (apart from its denoting action) we look to the voice or word of the speaker in making an assertion with certainty, doubt, or command.

The lion is an animal.

The word "lion" is a mark used to denote the lion itself.

The word "animal" is a mark to indicate the animal itself.

The word "is" denotes the speaker as asserting, "I say as a fact; I give you my *word* for it."

A verb is thus the *word* of the speaker. A finite verb is a word by which a speaker makes an assertion concerning a subject.

MEMORY NOTES.

A speaker expresses a fact of which he feels certain by the indicative mood.

To express doubt, he uses the subjunctive or conditional mood.

To express command, he uses the imperative mood.

To name an action apart from a subject, he uses the infinitive mood.

1. The indicative mood denotes a fact, as—He *writes*.
2. The subjunctive mood denotes a condition or a doubt, as—If he *be* good, I shall praise him.
3. The imperative mood denotes a command, as—Stop.

"Stop" agrees with "thou" or "you," understood.

4. The infinitive mood denotes an action apart from a subject, as—He likes *to play*.

LESSON XXXI.

PARSING OF THE VERB.

We will now collect together the various points we have shown to be expressed by the verb, so that we may parse it more fully.

Verbs indicate action, and they are intransitive or transitive according as they express action which ends with the subject, or action which passes over to an object.

We may then fix the two kinds of verbs—

1. Transitive verbs.
2. Intransitive verbs.

The next point of consideration is, "Is the verb regular or irregular?" We must first say the name of the verb by putting "to" before it; for example,—

Tom was here.

What verb is "was"? It is the verb "*to* be."

Tom went away.

What verb is "went"? It is the verb "*to* go."

Tom *has been walking* down the lane.

"Walking" being the last of the three words "has been walking," is the principal verb, while "has" and "been" are auxiliary verbs.

What verb is "walking"? It is the verb "*to* walk."

Having obtained the infinitive mood, or name of the verb, we proceed to add "d" or "ed" to it, to form the past tense; for example,—

"ed" added to "be" gives "be*ed*," but we say "was";
"ed" added to "go" gives "go*ed*," but we say "went";
"ed" added to "walk" gives "walk*ed*," which is the correct form of the past tense.

We see at once that "to walk" is a regular verb, and that "to be" and "to go" are irregular verbs.

The third point to notice is the mood of the verb.

Does it state a fact? If so, it is indicative mood.

Does it express a doubt? If so, it is conditional mood.

Does it indicate a command? If so, it is imperative mood.

Does it name an action without a subject? If so, it is infinitive mood.

The fourth point to notice is time—

Is it present, past, or future?

The fifth point is the state of the action.

Is it going on or imperfect, or is it complete or perfect action; or is it named as going on and finally complete? If the last, it is perfect progressive.

The state of the action is not fixed—that is, "indefinite"—in the simple tenses, and therefore this fifth point does not refer to them. The simple present and simple past have no auxiliary verb, but the simple future has "shall" or "will." We need not use the word "simple."

The state of action is—

(1) Imperfect, or
(2) Perfect, or
(3) Perfect progressive.

The sixth point is to find the subject by asking what the assertion is made about. This we can do by putting "who" or "what" before the verb; for example,—

Tom *sings*.

Who sings? Tom. Tom is the subject.

Then we inquire the number and person of the subject, and put the same number and person for the verb; for example,—

What number is Tom? Singular.

What person is Tom? Is he the speaker, first person? the hearer, second person? or neither speaker nor hearer, third person? Tom is third person.

Then "sings" is also singular number, third person, agreeing with "Tom."

These six points give us the full parsing of the verb as far as we have learned. We must commit them to memory in order:—

1. Kind—transitive or intransitive.
2. Formation—regular or irregular.
3. Mood—indicative, conditional, imperative, or infinitive.
4. Time—present, past, or future.
5. State of action—imperfect, perfect, or perfect progressive.
   (At this stage we use the word "tense"—for example, present perfect tense.)
6. Number and person agreeing with the subject.

To assist us in rapidly parsing a verb, it is well to learn to repeat a model by heart. Then it is a splendid exercise in "ploughing and harrowing" the thoughts to parse other verbs rapidly, altering the "model" where necessary.

Tom walks.

Walks.....Intransitive verb, regular, indicative mood, present tense, singular number, third person, agreeing with "Tom."

You will have been trying to sing.

(1) Will.....Auxiliary verb of the future tense.
(2) Will have.....Auxiliary verbs of the future perfect tense.
(3) Will have been...Auxiliary verbs of the future perfect progressive tense.

The auxiliary verbs should be stated first, but (1) and (2) above may be omitted.

Will have been trying...Transitive verb, regular, indicative mood, future perfect progressive tense, plural number, second person, agreeing with "you."

"You" is the true plural form, although it is now generally used to indicate a single person spoken to.

MEMORY NOTES.

In parsing a verb, name the kind, formation, mood, time, state of action, and the person and number agreeing with the subject.

Learn as a model—

I was playing.

I.....Personal pronoun, common gender, singular number, first person, nominative case to "was playing."
Was.....Auxiliary verb of past imperfect tense.
Was playing...Intransitive verb, regular, indicative mood, past imperfect tense, singular number, first person, agreeing with "I."

Interleaved Throughout.

PUPIL TEACHERS' ENGLISH NOTEBOOK.

By A. T. FLUX.

Indispensable to Pupil Teachers and Scholarship Students. This little book is not intended to be used as a substitute for, but rather as a notebook in conjunction with, a good text-book on English Grammar and Literature. It contains, in a convenient form for memorising, all the chief points set in English for Pupil Teachers in Schedule V., and includes the prefixes and affixes; English, Latin, and Greek roots; words derived from persons and places; common quotations and abbreviations; a short sketch of the history and growth of the language; common errors made in speaking and in writing; and a list of suitable subjects for essays.

T. NELSON AND SONS, 35 and 36 Paternoster Row, LONDON, E.C.

THE PRACTICAL INFANT-SCHOOL TEACHER.

AN INFANT-SCHOOL "AT HOME."

THE curriculum in infant schools and the methods of teaching differ widely from those in use a few years ago. When the parents of our present scholars were young, school was not nearly such an attractive place as it now is. The kindergarten system of teaching had been adopted in but few elementary schools, and the lessons in the infant department were of the same length and character as in senior departments.

It is only right that parents should know of this radical change in the education of their children; but the question is, How shall they be told? They do not read books on school method; they do not read educational journals—for example, THE PRACTICAL TEACHER—which treat of such matters. The only feasible plan is to invite them to the schools, that they may see for themselves how the teachers carry on the work.

Several schools in a certain division of London have tried the plan of asking the parents to visit the school on a certain day near the end of the school year, and have found it answer admirably. Their interest and sympathy have been enlisted, and a better feeling has been promoted between them and the teachers, which has resulted in more harmonious working, in support from parents in maintaining school discipline, and in increased attendance.

The following is a copy of the invitation sent to each member of the Board, to managers, and to the parents or guardians of every scholar:—

A School "At Home."

The Teachers of the.....School request the pleasure of the Company of

.....

ON

WEDNESDAY, JUNE 27, 1900,

To meet the Scholars, Members of the Board, and Managers of the School.

2.15 p.m. to 4 p.m. **INSPECTION of WORK of PUPILS.**

Classes may be seen at work at—Singing (including Action Songs), Physical Exercises (including Fan Drill and Musical Drill), Object Lessons, Drawing, Clay Modelling, Brush Work, Kindergarten Games, Kindergarten Occupations, Reading, Recitation, Needlework, etc., Children at Play.

Parents specially invited to inspect the work of the Classes in which their Children are taught.

The teachers were asked if there was any lesson they would like to give on the appointed day, and any deviation from the ordinary time-table was entered in the log-book.

Miss Nellie Dale's system of teaching *reading* having been adopted during the year, it was agreed that each teacher should give a short reading lesson, as this would be something quite new to the parents.

Kindergarten occupations were taken as follows in each class:—

I. Paper-creasing. III. Mat-plaiting.
II. Paper-folding. IV. Sticklaying.
V. Straw and paper threading.

The other lessons were *singing*, *recitation*, and *drawing*.

Free-arm drawing was taken in Class I. on millboards with coloured crayons, and bi-manual drawing on checkered paper in Class II., and on slates in Classes III. and IV. The work in the Hall was so arranged that the classes came out in turn as follows:—

2.10–2.20—*Babies.*—Free play.
2.20–2.30—*Babies.*—Kindergarten games ("Cat and Mouse," "The Coach").
2.30–2.45—*Class II.*—Swedish drill.
Action song ("Little Dame Trot").
2.45–3.0—*Class III.*—Recitation ("The New Baby").
Song ("Only a Baby Small").
Recitation ("A Dear Little Baby Brother").
Song ("Slumber Song"). Each girl had a doll for this.
3.0–3.20—*Class IV.*—Musical drill. [Apparatus used—large red reels with a half-yard of tape connecting them, which the teacher had dyed blue and yellow.]
Action song ("Three Little Kittens").
Action song ("The Spring has waked us from our sleep"). Four girls took the part of the daisies, four girls took the part of the buttercups, four girls took the part of the forget-me-nots, and one girl took the part of the rose.
3.20–3.40—*Class I.*—Action song ("Tommy Rook"). Tune—"Amorous Goldfish."
Action song ("The Japanese Fan"). Each child held a coloured fan.
Fan drill with coloured fans.
3.40.—All classes marched into the Hall and sang *en masse* nursery rhymes, with actions.
3.50.—Prayers and dismissal as usual.

A musical first-year pupil teacher undertook to play for the songs, kindergarten games, drill, and marching, thus leaving each teacher free to superintend her own class.

Some of the parents walked through the classrooms, and appeared greatly astonished at the work, particularly the blackboard illustrations of object lessons. But the hall was evidently the great attraction, and room could not be found for all the parents who desired admittance.

One of the Board members gave during the afternoon a short bright address calculated to increase the good feeling existing between teachers and parents, and begged the latter to send their children regularly and punctually to school, that they might lose nothing of the good education there given.

CLAY MODELLING.

CLAY MODELLING ranks first among the occupations for educational value. This occupation forms the habit of careful observation, as it is necessary to compare each part of the model with the object a number of times in order to copy it correctly. It is also a means of acquiring a lightness and delicacy of touch; the model requires most careful handling, or the shape will be completely spoiled.

Before modelling the object, the children will be encouraged to describe it accurately, dealing with the size, shape, colour, the different parts, and giving the use of each part—thus training the intelligence and teaching the children to express themselves correctly.

It is possible in many cases to supply each child with the object which forms the lesson. Children take a great interest and delight in bringing their own object; for instance, a ball, an orange, an apple, a potato, a daisy, and leaves, can easily be brought by many of them.

Some teachers object to clay modelling, thinking it a dirty occupation; this rests entirely with the teacher. If the clay is well beaten and not too moist, there is little danger of the children making any dirt. Of course care must be exercised in not allowing any pieces of clay to drop on the floor.

Clay modelling is not an expensive occupation; the clay lasts a considerable time, and the only additional apparatus consists of a small board, and one tool as shown in Fig. I.

I. *A Ball.*—Children should not be supplied with the exact

Fig. 1.

amount of clay, but should be trained to recognise the required quantity for the size of the object. Place the clay that has been prepared for the model in the palm of the left hand, gently squeeze it, then proceed to roll it with the palm of the right hand. After rolling a little time, examine the shape and compare it with the india-rubber ball. It will be noticed that there are

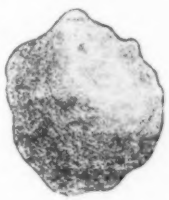


Fig. 1.

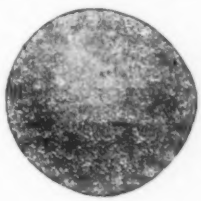


Fig. 2.

a number of lumps and marks on the model, as in Fig. 1; gently press the lumps with the thumb, and smooth out the cracks or marks. Now roll again; proceed in this way until the model is perfectly round and smooth, as in Fig. 2.

II. *The Apple.*—In teaching clay modelling, it is advisable to have one object thoroughly mastered before attempting another, as each one presents some new difficulty. It is better to model the russet apple first, and when the children have had a little practice other shapes might be attempted.

Proceed to make the ball as in the previous lesson. It will be noticed that the apple is not perfectly round like the ball; there is a hollow part at the top and the bottom. To make the hollow,

Fig. 1.

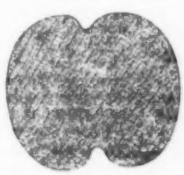


Fig. 2.

the ball must be placed between the finger and thumb and pressed. This does not give the correct shape, as will be seen in Fig. 1; therefore it must be completed by working the finger gently round the hole, making it wider at the top, as in Fig. 2.

The tip or eye of the apple is the most difficult part to make. Take a piece of clay about the size of a pea, press it carefully on the board, then divide it into five parts, leaving the centre whole. Illustrate this on the blackboard. Now lift up the edge of each

Fig. 3.

Fig. 4.

part: this completes the eye. Place it in one of the hollow parts. There is still the stalk to model. Take a small piece of clay and roll it on the board until it is as thin as an apple stalk. Now, with the point of the modelling knife, make a hole in the hollow part of the model, place in one end of the stalk, bend it a little, and break it off. This completes the model. (Fig. 4.)

III. *The Bird's Nest and Eggs.*—This is a very interesting lesson. Have a real nest, with eggs in it, for the children to examine; pass it round the class, allowing each child to handle it.

As in the previous lesson, the ball must again be modelled. To make the hollow part of the nest, cut out a piece of clay in the middle of the ball with the modelling knife. To make the top wider, hold the model in the palm of the left hand, place the thumb of the right hand on the outside of the model, and gently smooth it over the top into the centre; do this all round the hole until it is a good shape. (See Fig. 1.) To give the model the appearance of the nest, mark it all over with short, irregular lines crossing each other.

Now proceed to model the eggs. Take a small piece of clay,

Fig. 1.

make it into a ball, then roll it between the hands to make it oval. One end must be made nearly to a point; this is easily done by rolling one part a little longer. Model three or four eggs (Fig. 2) and place them in the nest (Fig. 3).

Fig. 2.

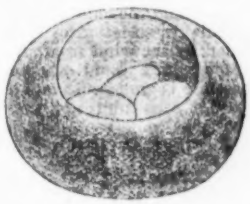


Fig. 3.

IV. *A Potato.*—Modelling a potato is an excellent means of training the powers of observation. After the first lesson the children will bring a potato and make an exact copy of it. Here lies the value of the training, as the most careful observation is necessary to make the eyes and marks of the model correspond with those of the potato. The ball must first be modelled; then, to make it oval, roll it between the hands; this gives it the shape as in Fig. 1. It will be noticed that the ends are too flat; to make them more pointed, place the hands in a cup-like position, with the palms and the little fingers joined, and the thumbs apart. Now place one end between the palms and gently roll;

Fig. 1.

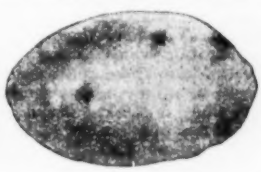


Fig. 2.

the same must be done with the other end. This completes the shape. (See Fig. 2.)

Now the eyes in the model must be made. Place the model in the left hand, and with the point of the modelling knife make a little hole; this hole must be gently pressed with the tip of the finger to make it smooth and a little hollow. Make several eyes in this way.

V. *A Carrot.*—The carrot teaches the conical shape. Attention must be drawn to the marks and tiny, threadlike roots of the carrot; these must be made very lightly, thus promoting delicacy of touch. To model the carrot, take a piece of clay about the size of a small apple, roll it into a ball, then proceed to roll it between the palms of the hands until it is the required thickness for the top part of the carrot. Now one end must be made to taper. This is easily done by placing the model on the board and with the right hand gradually rolling one end to a point. Stroke the top of the carrot gently with the thumb; now, with the modelling knife, make a fairly large hole. (See Fig. 1.)

Fig. 1.

Fig. 2.

To make the stalk, take a piece of clay about the size of a marble and make it flat by pressing it on the board with the thick part of the thumb, then cut off six or eight thin strips about an inch long, place them separately in the hole already made. Each one must be made secure by pressing it with the point of the knife. Fig. 2 shows the model finished.

THE CORRELATION OF SUBJECTS IN AN INFANT SCHOOL.

INFANT-SCHOOL TEACHERS are beginning to find that the day's work is made much more interesting if, instead of the ordinary disconnected time-table routine (reading, number, writing, etc.), a subject is selected round which the work may be grouped.

Memory is assisted and strengthened when one fact or idea can be made to suggest another; and if the work of a school is arranged with this object in view, the teacher's labours will be less arduous and the child's mental strain less severe.

It is this "association of ideas," voluntarily or involuntarily performed by the mind in adult life, which helps to recall to us many facts which would otherwise slip the memory. We cannot therefore begin to cultivate the practice at too early an age.

Instead of each subject of instruction being treated as a unit, it is possible to have a definite thread running through the whole, linking them together, and forming one common centre of thought.

One is thus able to make a unit of a week's work, and the plan will be seen to have many advantages.

To carry out the idea, the object-lesson list must be carefully compiled at the commencement of the year, such subjects only being chosen as will admit of subdivision, and mainly only those which are treated of in one or other of the reading books in use in the school. It is not possible in an article of this length to show how the plan could be worked in all the classes of an infant school. The work for the first class is given as an example.

The first fifteen or twenty minutes of the time devoted to secular instruction would be spent in a conversational lesson on the selected subject—say, a dog. On Monday, the general appearance, habits, and food of the animal would be dealt with; on Tuesday, structure as adapted to habits; Wednesday, kinds of dogs; Thursday, uses of dogs; and Friday, recapitulation.

This plan gives the teacher a further advantage, as a desired illustration which it was not possible to secure for a first or second lesson might be obtained later, and shown while the subject was still occupying the attention of teacher and taught.

Following the conversational lesson would come the reading lesson on "the dog," and after recreation the number lesson, which would deal with concrete numbers in connection with dogs, kennels, the miles run by a dog, etc.

In the writing lesson, words made use of in the object lesson would be set as copies. For example:—

Monday.—The dog is covered with hair.
Tuesday.—The dog has a wet tongue.
Wednesday.—There are many kinds of dogs.
Thursday.—Dogs are of great use to man.
Friday.—Dictation bringing in the above words, or a short composition on "the dog."

The afternoon session would begin with a word-building lesson, taking "dog" as a starting-point, followed by a recitation—for example, "My Dog Tray" (one verse to be learned each day)—and a song—for example, "The Poodle."

After recreation: on Monday, an occupation lesson would be taken—for example, pricking the outline of a dog or a kennel, embroidering ditto; on Tuesday, Wednesday, and Thursday, while the girls were at needlework, the boys would be occupied in drawing—first with aid of lines or rulers, and afterwards by freehand—a kennel; on Friday, a small lump of clay would be given to each child, and they would, with a little help from the teacher, try to model something to illustrate the lesson of the week—the best specimen to be preserved in the school museum. An interesting story read to the children would help to fix the subject in their minds, and the last lesson would be occupied in colouring with crayons or water-colours (always a favourite occupation with children) the pricked and drawn outlines above referred to. The best of these may be kept for the school album, to be shown to visitors to the school.

One of H.M.C.I. has been pleased to express his warm approval of this plan, and highly commended the intelligence of the children taught on this method.

MENTAL ARITHMETIC FOR INFANTS.

FIRST CLASS.

NUMBERS FROM 10 TO 100.

1. If I have forty-one balls of coloured wool and seven balls of black wool, how many have I altogether?
2. Sixty-four children went to a school treat with six teachers. How many cups would be wanted?
3. There were seventy-two cherries on a tree, and three had fallen to the ground. How many cherries were on the tree at first?
4. There were ninety-three words on the blackboard, and the teacher put seven more. How many were there then?
5. I had twenty-six boys in the first class, but four were sent out. How many were left?
6. There were thirty-nine sheep in a field, but seven strayed away. How many were left?
7. I had forty-four pennies, and I gave four away. How many had I left?
8. In my cupboard I have fifty-eight books, but three are too old to be used. How many can I give out?
9. There were sixty-four pounds of sugar in a shop, and the man sold four pounds. How many pounds were left?
10. There were seventy-eight children in school, and all went out but five. How many went out?
11. From eighty-nine take away five.
12. There were ninety-seven apples on a tree, and the wind blew five away. How many were left?
13. A man had twenty-five sovereigns, and he got twenty more. How many had he then?
14. If there are thirty-six children in this class and thirty in another class, how many are there altogether?
15. How many must you put to forty-two to make seventy-two?
16. I had seventy-three biscuits, and I put twenty more to them. How many were there altogether?
17. How many are eighty-seven and another ten?
18. There were sixty-six nuts in a bag, and I put in thirty more. How many were there then?
19. What number will thirty-nine and ten make?
20. I went seventy-one miles by train and twenty miles by coach. How many miles did I ride?
21. There are twenty-nine pencils in my drawer. If I use twenty, how many will remain?
22. I have thirty-nine pins. I use twenty; how many are left?
23. If I take away thirty from forty-five, what will be left?
24. There were fifty-seven books in a heap. How many have I taken away if thirty-seven are left?
25. From sixty-eight take away forty.
26. A woman bakes seventy-five buns and sells fifty. How many has she left?
27. Take away sixty from eighty-two.
28. There are eighty-five slates on a shelf. How many will be left when thirty are taken away?
29. I have two dozen reels in a box and nine more in my basket. How many have I altogether?
30. There are forty-nine boys in the school-yard and seven in school. How many boys are there altogether?
31. I gathered fifty-seven pears from one tree and five from another. How many pears had I?
32. After his sixty-fourth birthday a man lived eight more years. How long did he live?
33. How many are seventy-two and nine more?
34. A shopkeeper had eighty-five shillings in his drawer. A woman paid him eight more. How many had he then?
35. If I have eighty-eight buttons, and half a dozen more, how many will I have?
36. I had twenty-five shillings. I paid seven shillings for a pair of shoes. What had I left?
37. Of twenty-seven fowls I sell nine. How many have I left?
38. There were thirty-three cherries in a basket. I give seven girls each one. How many are left in the basket?
39. A shopkeeper had forty-two watches for sale, but only eight were sold. How many remained?
40. From fifty-seven take away nine.
41. There are sixty-two leaves in a book. If six are torn, how many whole leaves are there?
42. Out of seventy-one potatoes five are bad. How many good ones are there?
43. If eighty-two balls were put out, and I put three back, how many will you see?
44. If there are eighty-eight balls, and I take away nine, how many will be left?
45. Take nine away from ninety-three.
46. I gave out twenty-two pieces of chalk, and had fourteen left. How many pieces had I at first?
47. How many are thirty-six apples and twenty-two more?
48. There are forty-four pounds of tea in one chest and twelve in another. How many pounds are there altogether?

49. Of those fifty-six pounds of tea, twenty-four pounds were sold. How many pounds were left?
50. A woman had two bundles of boot-laces for sale. There were sixty-two black ones in the first bundle, and twenty-five tan ones in the second. How many laces had she?
51. She sold forty-three altogether. How many had she left?
52. On a paper of pins there were forty-five large ones and fifty-three small ones. How many pins were there altogether?
53. There were eleven pins in a row, and she sold three rows. How many pins had she left?
54. If I have sixty-five straight pins and thirty-two safety-pins, how many pins have I?
55. In half a year a man had fifty-eight sovereigns for wages, while his son had twenty-one sovereigns. How many sovereigns did they both earn in half a year?
56. Out of that sum seventeen sovereigns were paid for house rent. How much had they left?
57. On the roof of a house there were fifty-eight slates. How many were left when thirty-six were blown off?
58. On my piano there are eighty-five keys, and fifty are white keys. How many are black ones?
59. There are thirty-three yellow and thirty-three white flowers in a bed. How many are there altogether?
60. If I pluck forty-two of those flowers, how many will be left in the flower-bed?
61. There are ninety-five pills in a box. If fifty-three are taken out, how many will be left?
62. The postman took twenty-four letters to one side of our street and nineteen to the other side. How many did he give out?
63. In the evening there were twenty-nine for one side of the same street and eighteen for the other side. How many letters were there for that street at night?
64. The postman took forty-three in the morning and forty-seven at night. How many was that for the day?
65. Of those letters, twenty-six were in blue envelopes. How many were in white ones?
66. There were two wagons. On the first there were thirty-seven bags of flour, and twenty-eight on the second. How many bags were there?
67. At a baker's the man had to leave forty-nine of those bags. What number of bags must he take from the second wagon to put to those of the first wagon to make up the forty-nine?
68. How many bags were left when forty-nine were taken away?
69. What does sixteen want to make it into fifty-two?
70. There were twenty-six women and forty-nine men going away by a trip. How many were there both together?
71. There were also twenty-five children going, and nine were boys. How many were girls?
72. How many men, women, and children went altogether?
73. In a station two sets of bills were hanging. Fifty-six were for trips into the country, and thirty-nine for trips to the seaside. How many bills were there?
74. On one classroom floor there were thirty-eight marks, and on another there were twenty-nine. How many marks were there altogether?
75. How many more marks must I put to have both numbers alike?
76. To which number must they be added?
77. How many marks would there be altogether, when both numbers were alike?
78. What number put to seventy-six will make one hundred?
79. In a school lobby there are twenty-seven pegs on one side and fifty-four on the other. How many children can have a peg each?
80. If out of those children seventeen stayed at home, how many pegs would be used?
81. How many flags would forty-six children use for drill, if each child had two?
82. Suppose I used one hundred flags, and the teacher took one pair, how many children could be drilling?

NEW VARIED OCCUPATIONS.

PAPER FLOWERS.

SIMPLE METHOD OF MAKING PAPER FLOWERS.

How to Make the Iceland Poppy.

Iceland poppies can be made of white or any shade of yellow crinkled paper.

Petals.—To make the petals, cut a strip of white crinkled paper measuring 6 inches by 2 inches, and shape this into four petals, as shown in Illustration 1.

To form the Centre.—Take a piece of yellow tissue paper 7 inches by 3 inches, roll it up, and then double it, twisting it to keep it together. Cut a piece of pale green tissue paper measuring 4 inches by 2 inches, and cut a fine fringe 1 inch deep along the one side of it; roll this round the twisted yellow centre, and fasten firmly with tie wire to the stem wire.

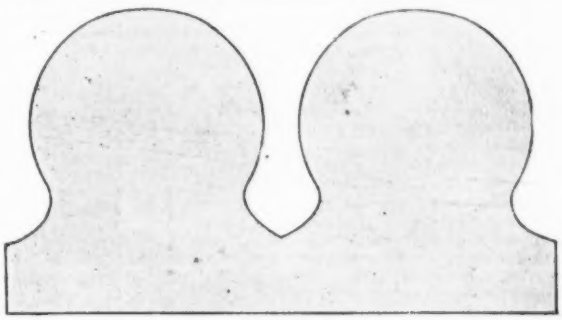


Illustration 1.

To make the Flower.—Arrange the petals round the centre, and then fasten firmly to the stem with tie wire.

Stem.—Cut a long narrow strip of green paper and twist it round the stem wire.

On Making the Wild Rose.

Wild roses can be made in pale pink or white tissue paper, with yellow tissue paper for the centre, and dark green tissue paper for the stem.

Petals.—To form the petals, take a piece of tissue paper measuring 7½ inches by 2 inches, and shape it into five petals as shown in Illustration 2, and curl the sides slightly.

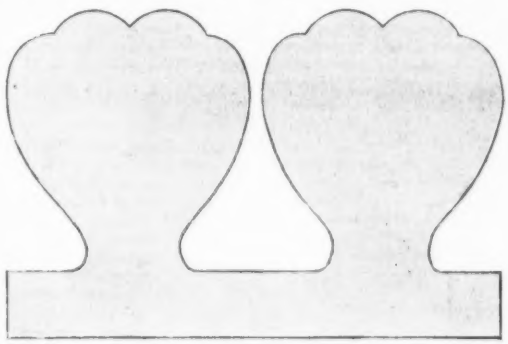


Illustration 2.

To form the Centre.—Cut a strip of yellow tissue paper measuring 6 inches by 2 inches, cut it into a fine fringe 1 inch deep as shown in diagram; roll this up, and secure firmly with tie wire to the stem wire.

Calyx.—Take a piece of dark green tissue paper 1 inch square, cut into four petals and make a hole in the centre.

Illustration 3.

To finish the Flower.—Take the petals and arrange them round the centre so that the petals will meet. Then take the calyx and push the stem wire through the centre, close up to the petals, and finish the stem by twisting a narrow piece of dark green tissue paper round the stem wire.

Illustration 4.

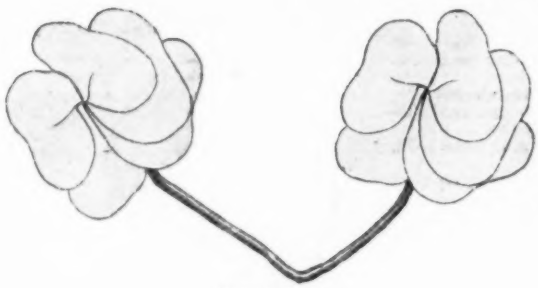


Illustration 5.

Rose Camellias and Rose Carnations may be made as the wild rose, but having the number of petals doubled, and rounding instead of scalloping the petals, as in the diagram No. 2, and then fringe, slant, and curl.

How to Make Geraniums.

Geraniums can be made in white, pink, or scarlet tissue paper, with dark green tissue paper for the stem.

To form the Flower.—Cut a strip of tissue paper measuring 24 inches by 6 inches, fold it, and cut it into six pieces. This will make twelve flowers.

Petals.—To form the petals, take one piece of the tissue paper and fold it five times lengthwise, then make into petals at each end as shown in Illustration 4; roll this round, and twist it, from one petal to the other, as shown in Illustration 5.

To finish the Flower.—Cut a narrow strip of dark green tissue paper measuring 4 inches by ½ inch, and twist this from petal to petal, then double it. This makes two flowers. Take the remaining five pieces of tissue paper separately, fold and cut these in the same way. Make in all twelve flowers. Fasten these all firmly together with a piece of tie wire to the stem wire, then twist a narrow strip of dark green tissue paper round the stem wire to cover it.

QUEEN'S SCHOLARSHIP EXAMINATION, 1901.

REGULATIONS.

THE examination for admission into training colleges, and for the office of assistant teacher, called the Queen's Scholarship Examination, will be held on December 10, 1901, at each of the residential training colleges, and at such other centres as may be necessary.

1. Candidates cannot be admitted to the examination unless application has been made to the Board of Education on their behalf before October 1.

2. Candidates who desire to be examined at a training college must make their own arrangements for securing a seat with the authorities of the college. To those who do not desire to present themselves for examination at a college, a choice of centres will be offered; the exact address of the place of examination at the centre selected will be communicated to each candidate as early as possible in November.

3. Candidates who have not been pupil teachers must be over eighteen years of age on September 1, 1902. The date of birth must be stated to the Board of Education at the time of application for permission to sit at the examination. They must also produce a medical certificate in a form approved by the Board of Education (Form 42 Q.S.).

4. Candidates who fail twice to pass the Queen's Scholarship Examination may only be again examined upon the conditions specifically stated in the Code for the time being.

5. The subjects of examination, as shown in detail below, are:—

(1.) Reading.
(2.) Repetition.
(3.) Penmanship.
(4.) Dictation.
(5.) Theory of Teaching.
(6.) Practical Teaching.
(7.) Geography.
(8.) History.
(9.) English Composition.
(10.) English Language and Literature.
(11.) Arithmetic.
(12.) Algebra (*men only*).
(13.) Euclid (*men only*).
(14.) Domestic Economy (*women only*).
(15.) Needlework (*women only*).
(16.) Elementary Science.
(17.) Languages.
(18.) Drawing.
(19.) Music.

Of which all, or any, may be taken up by the candidate. The position of successful candidates is determined by the aggregate number of marks obtained. The list is arranged in three classes.

6. Candidates are informed by letter from the Board of Education of the result of their examination, and those who obtain a place in the first or second class are eligible for admission as Queen's Scholars to a day or residential training college for a period of training commencing with the academical year next or next but one succeeding the date of the Queen's Scholarship Examination.

7. Copies of the papers set at previous examinations may be obtained from Messrs. Eyre and Spottiswoode, East Harding Street, Fleet Street, E.C., or through any bookseller, price 6d. each.

DETAILED SYLLABUS OF THE SUBJECTS OF EXAMINATION.

(The maximum number of marks obtainable in each subject is placed within brackets.)

Candidates who obtain less than 25 per cent. of the marks allowed for any subject marked with an asterisk will not be credited with any marks for that subject, and those who obtain 25 (or more) per cent. of such marks will have their marks adjusted as the Board of Education may deem necessary in order to prevent undue credit being obtained for a low degree of knowledge.

1. Reading:—[60.]

To read with ease and clear enunciation from one of Scott's Novels or from one of Macaulay's Essays.

2. Repetition:—[40.]

To repeat one hundred lines of Shakespeare or Milton with clearness and force, and knowledge of meanings and allusions.

In Welsh districts fifty lines of Shakespeare or Milton may be taken with fifty lines from a standard Welsh author.

N.B.—Candidates employed in public elementary schools must perform the exercises in reading and repetition at an inspection of their school, or at a collective examination in the year in which they present themselves for the Queen's Scholarship Examination. Other candidates will be heard at the place of examination. These marks cannot be carried forward to a future examination.

3. Penmanship:—[30.]

(1.) To write legibly.
(2.) To set copies in large and small hand.

4. Writing from Dictation:—[50.]

5. THEORY OF TEACHING :—[100.]
   (1.) Notes of lessons.
   (2.) The methods of teaching any subject taught in elementary schools.
   (3.) The methods and principles of infant teaching and discipline.

6. PRACTICAL TEACHING :—[100.]
   To teach a class in an elementary school.

N.B.—Marks can only be obtained by candidates who are employed as teachers in any recognised capacity, or who have been so employed, within two years preceding the examination, in public elementary schools, Poor Law schools, schools certified under the provisions of the Elementary Education (Blind and Deaf Children) Act, 1893, or the Elementary Education (Defective and Epileptic Children) Act, 1899, certified efficient schools, reformatory schools or industrial schools, and who have been duly recognised in that capacity as members of the school staff. The candidate must teach at one of the inspector's visits to the school during the two years preceding the Queen's Scholarship Examination.

The inspector may ask questions as to the methods of teaching adopted by the candidate.

In Welsh districts, credit will be given for ability shown in utilising the children's knowledge of Welsh.

7. GEOGRAPHY :—[100.]
   Outlines of the geography of the world, with special reference to the British Isles, India, and to the chief British colonies and dependencies.
   Candidates are advised to practise the drawing of sketch-maps, and to illustrate their answers by means of them. No detailed maps will be required at the examination.

In Welsh districts, some of the questions set will relate to Welsh geography and Welsh industries.

8. HISTORY :—[100.]
   Outlines of English history from the Norman Conquest to 1870, with special reference to the expansion of the British Empire from 1558 to 1858.

In Welsh districts, some of the questions will relate to Welsh history.

9. ENGLISH COMPOSITION :—[75.]
   To write a short essay upon a given subject.

10. ENGLISH LANGUAGE AND LITERATURE :—[100.]
   (1.) Parsing and analysis of sentences.
   (2.) Elementary etymology, and a general outline of the history of the English language.
   (3.) A general knowledge of the style and subject-matter of one of the following books :—
   Shakespeare's *Julius Cæsar*.
   Goldsmith's *Traveller*.

In Welsh districts, the sentences set for parsing and analysis may be partly Welsh.

11. ARITHMETIC :—[100.]
   The principles and practice of arithmetic, including the measurements of rectangular areas and solids.

12. ALGEBRA :—[125.] (*For men only.*)
   As far as, and including, quadratic equations of one unknown quantity, with easy problems leading to any of these equations, together with simple questions on ratio, proportion, variation, and arithmetical progression.

13. EUCLID :—[100.] (*For men only.*)
   Books I. and II., with simple geometrical exercises.

14. DOMESTIC ECONOMY :—[80.] (*For women only.*)
   (1.) Food : its functions and preparation.
   (2.) Clothing and washing.
   (3.) Rules for warming, cleaning, and ventilating the dwelling.
   (4.) Rules for preserving health.
   (5.) The management of a sickroom.
   (6.) Thrift.

15. NEEDLEWORK :—[100.] (*For women only.*)
   (1.) The various stitches used in making and mending calico and flannel underclothing.
   (2.) The cutting out, by proportion or by measurement, of a girl's chemise, drawers, and flannel petticoat.

*16. ELEMENTARY SCIENCE :—[100.]

SECTION 1. [50.]

Matter.—Forms of matter. Indestructibility of matter. Mass, volume, density, specific gravity, weight. Centre of gravity.

Force: Motion and Inertia.—The parallelogram of forces. Composition and resolution of forces. Conversion of rectilinear into circular motion.

The Mechanical Powers.—Principles of the lever, the pulley, the inclined plane, and the screw.

Energy.—Heat, radiation, electricity, and chemical action as forms of energy. Mechanical work.

Heat and Temperature.—Discrimination between heat and temperature. Effects of heat. The measurement of temperature by thermometers. Change of state caused by heat, as in ice, water, and steam.

Radiation.—Rectilinear propagation of radiation. Reflection and refraction of radiation. The analysis of light by a prism, and its recomposition. The colour disc. The visible spectrum.

Elementary Chemistry.—Mixtures and compounds. Water: its composition proved by analysis and synthesis; its physical properties. Elementary properties of oxygen, nitrogen, hydrogen, carbon, iron and mercury, and of water, carbon dioxide, lime, silica, and the alkalis, common salt, iron oxide, and mercuric oxide.

Terrestrial Magnetism.—Properties of the loadstone and artificial magnets. The earth a magnet. Primary laws of magnetic attraction and repulsion. Dip. The earth's magnetic poles.

SECTION 2. [50.]

Elementary Chemistry.—Elementary properties of chlorine, sulphur, phosphorus, marsh gas, coal gas, hydrochloric acid, sulphuric acid, and nitric acid; of the common metals—for example, lead, copper, etc.

Combination by weight and by volume. Explanation and use of chemical formulæ.

Elementary Astronomy.—Measurement of angles by degrees, minutes, etc. Determination of positions of celestial bodies by azimuth and altitude. Elementary descriptions of chief apparent motions of (1) fixed stars, (2) sun, (3) moon, and simple explanations of such motions.

Simple explanations of phases of moon, lunar and solar eclipses, and seasons.

Telescopic appearance of moon.

N.B.—It is expected that candidates will obtain an experimental knowledge of the chemistry and physics set forth in this syllabus. The syllabus has therefore been so arranged that the necessary experiments can be conducted without any expensive apparatus or materials. Suitable experiments will be found in the syllabus for the elementary stage of physiography as set forth in the *Science and Art Directory*.

It is expected also that candidates shall be trained to notice and record the positions of the various heavenly bodies.

*17. LANGUAGES :—[100 each.]
   (i.) Latin.—Cornelius Nepos: Lives of Miltiades and Epaminondas.
   (ii.) Greek.—Xenophon's *Anabasis*, Book II.
   (iii.) French. } No set books.
   (iv.) German. }
   (v.) Hebrew.—The Book of Genesis.
   (vi.) Welsh.—*Cwcledigaethau y Bardd Cwsg* (O. M. Edwards, Welsh National Press Company, Carnarvon).

Each paper will contain, in addition to passages for translation into English from the set book, grammatical questions and easy passages for translation from English into the language chosen.

There will be easy unseen passages for translation into English.

N.B.—Marks may be obtained for any two of the above languages, but not for more than two.

*18. Drawing:—[60.]

Freehand Drawing as recognised for an Elementary Drawing Certificate under the Board of Education.

*19. Music:—

(*a*) Theory of Music:—[20.]

Staff Notation.

All the major and minor scales and signatures. Diatonic and chromatic intervals. Easy transposition. The value of notes, dotted notes, and rests. Bars and time signatures. Transposition of time. Syncopation. Compass of voices. Common musical terms.

Or,

Tonic Sol-fa Notation.

The major and minor modes. Bridge notes and first removes of key. Chromatic names. Relative pitch of keys and notes. Diatonic and chromatic intervals. Pulses, measures. Pulse division in halves, quarters, thirds, etc. Syncopation. Compass of voices. Common musical terms.

(*b*) Practical Music:—[30.]

Graded tests in tune, time, and ear training, based upon the requirements for the various school divisions.

The highest marks will be given to candidates able to sing at sight passages combining time and tune, and to tell ear exercises freely.

(i.) Candidates may take theory of music without also taking practical music.

(ii.) The tests can be sung from the staff or tonic sol-fa notation at the option of the candidate.

(iii.) Each candidate will be tested in time and one other point (note or ear).

(iv.) No songs are required.

University Extension Certificates.

Subject to the following regulations, marks up to a maximum of 125 may be obtained at any examination for University Extension Certificates held by the University of Cambridge, the University of Oxford, the University of Durham, the Victoria University, or the Universities Joint Board of the London Society for the Extension of University Teaching, or by any college of university rank approved by the Board of Education for the purpose.

1. The subject of examination must be connected with one of the following branches of knowledge:—

(*a*) English Language and Literature.
(*b*) Geography.
(*c*) History.
(*d*) Languages.

2. The subject chosen, and a syllabus of the lectures on which the examination is based, must be previously approved by the Board of Education.

3. The course must consist of not less than twenty-four lectures, supplemented by classes.

4. Candidates must have attended at least two-thirds of both the lectures and classes, and must also have worked at least two-thirds of the papers in connection with such classes to the satisfaction of the lecturer.

5. The examination must be held after the completion of the approved course of lectures during the twelve months preceding the Queen's Scholarship Examination at which the candidate presents himself.

6. The examination must be conducted by a competent examiner other than the teacher or lecturer.

7. A candidate who is credited with marks at any such examination may not be credited with marks for the corresponding subject in this syllabus.

IDEAL BOOKS FOR HOLIDAY READING.

At this season of the year our readers are doubtless deluged with notices of works available for holiday reading. To those who would take a turn at Dickens or Thackeray we recommend, as a perfect holiday companion, a volume of the New Century Library by Messrs. T. Nelson and Sons. The New Century Library is a series of handy volumes such as may be slipped into the pocket, knapsack, or portmanteau. All are pocket size, printed on "Royal" India paper—strong, perfectly opaque, and the thinnest printing paper in the world—issued and bound in limp cloth or leather at 2s., 2s. 6d., and 3s. net.

Among the many special features of this really unique series is the large, clear longprimer type employed. "Longprimer" is the largest fount in this journal, and if our readers will turn to Dr. Newsholme's paper on "Hygiene," in this issue, they will have before them an example of the size of type referred to.

Each volume measures only 4¼ by 6½ inches, and is just over half an inch in thickness. For the first time book buyers can therefore obtain the novels of Dickens, Thackeray, etc., complete in one volume of large type and pocket size. The "Royal" India paper of the New Century Library is the same as that used in Messrs. Nelson and Sons' series of Bibles. It is so thin that sixteen hundred pages are only one inch thick.

Of the New Century Dickens the following volumes have already been published:—*Pickwick Papers*, *Nicholas Nickleby*, *Oliver Twist* and *Sketches by Boz*, *Old Curiosity Shop*, *Martin Chuzzlewit*, *Barnaby Rudge* and *Dombey and Son*; whilst *Vanity Fair*, *Pendennis*, *The Newcomes*, *Henry Esmond*, represent the list of the New Century Thackeray.

INTERNATIONAL CORRESPONDENCE FOR TEACHERS.

LEARNING A LANGUAGE BY LETTER-WRITING.

We have just received from our good friend M. Mieille a carefully-prepared report on the subject of International Correspondence. As our readers are aware, this scheme owes its existence and success to the initiative and perseverance of M. Mieille of Tarbes.

In January 1897, Mr. W. T. Stead first wrote upon the matter in the columns of the *Review of Reviews*, and since that date has, month by month, devoted a page to the "Correspondence." Upon reading the article referred to, we at once caught Mr. Stead's enthusiasm, and asked to be allowed to co-operate with him, specially on behalf of *teachers*. The results tabulated in the report before us show that our efforts were not in vain. By means of the *Review of Reviews* and the *Revue Universitaire*, 10,700 English and French scholars have held international communication. German-French and French-Italian schemes of correspondence have also arisen out of this in connection with other journals, and the grand total is now announced at 17,000, of which 8,500 French scholars have, since January 1897, exchanged more than 30,000 letters per month, or 300,000 per year!

With regard to ourselves, the result is 1,500 *teachers*. During the past two years we have received applications from teachers in all parts of the country, as well as from students, teachers, inspectors, and editors in different parts of Europe. A number of colonial readers have also sent in their names, and among the last came applications from lady teachers in South Africa.

Space prevents our giving more attention to the report this month; but in view of the near approach of the summer holidays, we have reserved a corner in order once more to call attention to the scheme as being a most interesting and effective means of learning French by correspondence with teachers in France. As we have previously stated, names and addresses of correspondents are forwarded to Paris *gratuitously*.

The following letter has been recently received by us:—

"Paris.

"Monsieur,—J'ai eu l'occasion d'apprendre dernièrement que vous vouliez bien vous occuper de mettre en rapports de correspondance des jeunes gens anglais et français.

"Serait-ce prendre auprès de vous une trop grande liberté de vous demander pour moi l'adresse d'un jeune Anglais?

"J'ai 25 ans. J'ai fait mes études classiques dans un lycée de l'université et je cultive la langue anglaise depuis plusieurs années.

"J'espère, monsieur, qu'il vous sera possible de m'attribuer un correspondant qui me convienne. Je désirerais *beaucoup* qu'il habitat Londres.

"Veuillez agréer, monsieur, avec mes remerciements anticipés, mes hommages très distingués.

"Pierre Préteux, 31 Rue d'Assas, Paris."

OUR TUTORIAL SECTION

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

Principal of the Belvedere Pupil Teachers' Centre, First on Scholarship List, Author of "Scholarship School Management," "Building of the British Empire," etc.

SPRING EXAMINATION, 1901.

Fourth Month—August.

WORK TO BE PREPARED.

1. READING AND RECITATION.

CONTINUE oral practice in these subjects before a competent critic. Something more than mere verbal exactness is required.

2. ENGLISH.

Candidates.—*Marmion*, Canto vi., lines 351–443, with knowledge of all allusions, etc.

First Year.—*The Traveller*, lines 145–190, with knowledge of roots, allusions, etc.

Second Year.—*Julius Cæsar*, from Act ii., Scene 1 ("I am not well in health"), to the end of Act ii. The derivations of all important words, the meaning of allusions, etc., must be thoroughly prepared.

(For full Notes on Parsing, Analysis, etc., see August Number, 1899.)

Composition.

Send up essays occasionally for criticism. A good style of composition is of the greatest importance in all written examinations. Prepare a skeleton plan before writing. It is a good practice to read the essay *aloud* when finished. The ear will often detect weaknesses which the eye misses.

Subjects for the month:—*Birds; A Day at the Seaside; The Races of Mankind; Any Walk you have taken; "A bird in the hand is worth two in the bush;" Fairy Tales.*

Several of these will need reading up before being attempted.

3. HISTORY.

Candidates.—Edward I., Edward II., Edward III., and Richard II.

Chief Points:—

Edward I.

(*a*) Legal measures.
First Statute of Westminster.
Quo Warranto Inquiry.
Statute of Mortmain (very important).
Second Statute of Winchester—minor but very important police regulations.
Statute of Quia Emptores—to prevent subinfeudation of land.
(*b*) Conquest of Wales, and the Statute of Wales.
(*c*) Judicial Reforms. The overcrowded Courts of Justice divided into—(1) Court of Exchequer, (2) Court of Common Pleas, (3) Court of King's Bench, with an adequate staff of judges to each.
(*d*) The war with Scotland. Prepare a table to illustrate descent of claimants.

Edward II.

(*a*) The king's favourites—Gaveston and the De Spensers.
(*b*) The Lords Ordainers.
(*c*) Events leading up to the battle of Bannockburn. Prepare a plan of the battle.
(*d*) Deposition and death of the king.

Edward III.

(*a*) The Hundred Years' War. Note the causes of this—the alliance of French and Scots, French raids on the south coast, the rising of the Flemish wool towns against the Count of Flanders, and the intervention of the French king. The latter was the *real* cause. Edward's claim (quite a futile one) was put forward to secure some of the wavering vassals in the north of France.
Battles of Creçy and Poictiers (prepare plans), and Treaty of Bretigny.
(*b*) The Black Death, Statutes of Labourers, and the effects upon the villeins.
(*c*) Statute of Provisors—against the Pope making appointments in the English Church.
Statute of Treason—limiting the application of the term to certain acts.
Statute of Præmunire—against appeals to Rome.
(*d*) Black Prince in France.
(*e*) Declining years of the king.

Richard II.

(*a*) The Peasants' Revolt. This is most important, and must be carefully prepared. Causes and effects.
(*b*) The king's minority.
(*c*) Period of Absolute Rule. Deposition and death.

First Year.—Edward I. and Edward II. (as above).

Second Year.—Charles II. A reign distinguished by selfish legislation, by dissolute life at Court, by repression of Nonconformists, and a general rejection of the Puritanical yoke.

(1.) The Clarendon Code.
(2.) The Dutch War. Contrast the conduct of this with that under Cromwell. (Read Pepys' *Diary* for a peep behind the scenes.)
(3.) The Great Plague and Great Fire.
(4.) The Secret Treaty of Dover. England to help France against the Dutch, Charles to receive £300,000 per annum and restore Roman Catholicism. The most scandalous treaty ever signed for England.

4. GEOGRAPHY.

Candidates.—England. The southern counties.

First Year.—Denmark, Norway and Sweden, Holland and Belgium.

Second Year.—Finish and revise the whole of Africa. An account of the present war must be carefully prepared.

5. ARITHMETIC.

Candidates.—Vulgar fractions, and their application to weights and measures. Guard against the common error of reducing everything to fractions. Thus, $\frac{1}{17}$ of £12, 11s. 10½d. is best done by multiplying by 13 and dividing the result by 17.

First Year.—Compound proportion. Work in *three* lines by method of unity.

Second Year.—Discount. The meaning of the terms must be thoroughly understood.

6. EUCLID AND ALGEBRA.

First Year.—Euclid.—Props. 9–12, and two deductions per week.

Algebra.—Multiplication; harder examples, with literal coefficients.

Second Year.—Euclid.—Props. 39–42, with four deductions per week.

Algebra.—Multiplication and division of fractions. Use factors wherever possible.

7. MUSIC.

Candidates.—Whole-pulse and half-pulse notes, continuations, and rests.

First Year.—Thirds of a pulse.

Second Year.—Relative pitch of keys.

(For Board of Education Regulations Scholarship 1901, see page 90.)

8. Teaching.

All Years.—Continue regular practice in writing on the blackboard.

Test Questions.

1. *Penmanship.*—*All Years.*
   Large Hand:—*Mithridates.*
   Small Hand:—*The sports of children satisfy the child.*
2. *English.*—*Candidates.*—Analyse lines 257–264, *Marmion*, Canto vi., and parse *perchance, tell, featly, peace to teach, best, rest.*
   First Year.—Paraphrase lines 99–110, *The Traveller.*
   Analyse lines 99–104, and parse *let, try, as, for a while, cares; resigned, like, you.*
   Second Year.—Paraphrase Brutus's speech commencing, "No, not an oath."
   Analyse as far as "redress," and parse *oath, be, betimes, enough to kindle, what need be, our own.*
3. *History.*—*Candidates.*
   (*a*) Give an account of the conquest of Ireland. Was it a "conquest"?
   (*b*) Explain clearly what led to the passing of the Constitutions of Clarendon.
   (*c*) What events led to the signing of the Magna Charta? What were its chief provisions?
   (*d*) In what respect did De Montfort's Parliament differ from those preceding it?
   First Year.
   (*a*) Enumerate, with a sketch-map, Henry the Second's possessions.
   (*b*) Explain Romescot, Interdict, Excommunication, Scutage.
   (*c*) Give an account of England during Henry the Third's minority.
   (*d*) Write about twenty lines on De Montfort's Parliament.
   Second Year.
   (*a*) Describe the different forms of government from 1642 to 1660.
   (*b*) Say what you can of Cromwell's foreign policy.
   (*c*) Give some account of the reduction of Ireland.
   (*d*) Explain clearly what took place between Cromwell's death and the return of Charles the Second.
4. *Geography.*—*Candidates.*
   (*a*) What are the chief industries of England, and where are they carried on? Arrange your answer in tabular form.
   (*b*) Give a full account, with sketch-map, of Yorkshire.
   First Year.
   (*a*) What do you understand by the term Germany? Give an account of its government.
   (*b*) What are the chief industries of Italy? How do you account for its comparatively low condition among the Great Powers?
   Second Year.
   (*a*) Say what you can of the West Coast possessions.
   (*b*) Describe the course of the proposed Cape to Cairo Railway. What portions of it are completed? Illustrate with a sketch-map.
5. *Method.*—What is the best way of correcting dictation exercises?

AUTUMN EXAMINATION, 1900.

Eleventh Month—August.

Work to be Prepared.

1. English.

Revise generally.

2. Arithmetic.

Continue working general exercises, especially problems. The theory must receive careful attention. Without a thorough knowledge of this it is impossible to work the sums now set in examinations.

3. Geography.

Revise Europe. Practise maps.

4. History.

Revise the first half of the work.

5. Euclid.

First Year.—Revise Props. 20–26.
Second Year.—Revise Props. 40–48.
A good deal of time must be spent in working deductions.
A collection of recent questions will be given next month in the important subjects.

For Test Questions, work the following Test Examination:—

Test Examination.

The questions should be answered under examination conditions, and strictly in the time specified.

If desired, the papers will be marked, criticised, and returned. Such papers must be sent to Mr. A. T. Flux, The Bays, Belvedere, Kent, together with a postal order for 2s.

Candidates.

Geography.

(Time, ¾ hour. 80 marks. Answer Question 1 and *two* others.)

1. Say what you know of *six* of the following:—Himalayas, Red Sea, Yang-tse-kiang, Iceland, Mississippi, the Andes, the Sahara, Caribbean Sea.
2. Say what you can of the rivers of Africa.
3. Make a table of the chief coalfields in Great Britain, and give the chief towns found on them.
4. Write four or five lines on each of five of the following:—The Fens, Giant's Causeway, the Downs, the Bog of Allen, the Minch, Dartmoor, the Dogger Bank.
5. Say what you can of the following places:—Cambridge, Galashiels, Barrow-in-Furness, Inverness, Limerick, Stornoway.

History.

(Time, ¾ hour. 80 marks. Answer *three* questions, including the *first* if you can.)

1. Make a list of ten important treaties made in English history, and give the terms of one of them.
2. Point out, briefly, the different events by which the British Isles were united under one sovereign.
3. Who were the following:—Stephen Langton, Raleigh, Wolfe, Clive, and Wycliffe?
4. Give the dates of the following measures, and say what you can of any two of them:—Statute of Mortmain, Statute De Heretico Comburendo, Habeas Corpus Act, Septennial Act, the Reform Bill, and Stamp Act.
5. Give an account of any rebellion that has taken place in England, under the following heads:—Causes, Events, Results.

English.

(Time, ¾ hour. 80 marks. Answer *three* questions, including the *first* if you can.)

1. Analyse the following passage, and parse the words in italics:—

> "*Himself* he swift on horseback threw,
> *Scarce* to the abbot bade *adieu*;
> *Far less* would listen to his prayer,
> *To leave* behind the helpless Clare."

2. Explain the following phrases:—"Stint in thy prate;" "No hope of gilded spurs to-day;" "Fell England's arrow-flight like rain;" "to shrieve the dying;" "billmen ply the ghastly blow."
3. Give, in your own words, a brief description of the battle of Flodden.
4. Explain the force of the suffixes in the following words:—*sapling, disastrous, wildness, matchless, firmer, bishopric, thoughtful.*
5. Explain Indirect Object, Passive Voice, Extension of Predicate, and give two examples of each, quoting, if you can, from the poem.

Music.

(Time, 15 minutes. 15 marks. Answer *three* questions.)

1. What other notes of the scale are separated by the same intervals as:—

   l, t, d r; m f s l; d r m f?

2. Name the following intervals:—

   d-f, r-t, t,-f, m-f, r-d'

3. Write over each note and rest in the following its value in pulses and fractions of a pulse:—

   | d : r.m | f :-.s | m : -. | :d | m :- |-.f : r | s.l :- | d :- ‖

Composition.

(Time, 30 minutes. 4 marks.)

Write a short essay on one of the following subjects:—
(*a*) The Food Supply of England;
(*b*) Kindness to Animals; or
(*c*) A Short Life of Sir Walter Scott.

Arithmetic.

(Time, 1 hour. 100 marks. Answer *three* questions, including the *first* if you can.)

1. (*a*) Multiply 359 by 997 by the shortest method you can.
   (*b*) How would you work the following mentally:—
   $(2939 \times 147) + (2939 \times 653)$?
   (*c*) How could you tell at sight that the following is wrong:—
   $2347 \times 197 = 469529$?
   (*d*) If 1·39 is divided by ·37, what is the exact value of the remainder after the *fourth* subtraction in the sum?

2. The L.C.M. of two numbers is 1512, their G.C.M. is 72: if neither of them is the same as the G.C.M. or L.C.M., find the two numbers.

3. The greater of two quantities is $4\frac{1}{4}$, and twice their difference is $3\frac{1}{12}$; by how much is the smaller quantity less than 3?

4. Find the value of 8·125 of 2 tons 4 cwt., and the difference between $3\cdot\dot{0}69\dot{3}$ of 8s. 5d. and £$\cdot 641\dot{6}$.

5. A man swam across a lake 3 miles wide in $2\frac{3}{4}$ hours. If he made a stroke with his arms every other second, find how many inches he travelled between each stroke.

Elementary Science.

(Time, $\frac{3}{4}$ hour. 100 marks. Answer *three* questions.)

1. What do you understand by "indestructibility of matter"? Mention any experiments you have seen, or read about, which prove that matter is indestructible.

2. A piece of cardboard 5 inches long and 2 inches wide is divided into ten squares. One of the two middle squares is cut away. Show how you would find the centre of gravity.

3. A stake is lightly driven into the ground, and three ropes attached to it. One man pulls north with a force of 12 lbs., another pulls east with a force of 13 lbs. With what force must a third man pull to just counteract the other two? Draw a diagram to show the direction in which he must pull.

4. Explain clearly why the earth moves round the sun.

5. What do you understand by "mechanical advantage"? Draw or explain an arrangement of pulleys by which 1 lb. just balances 6 lbs. (Friction and weight of rope and pulleys to be neglected.)

FIRST YEAR.

Geography.

(Time, $\frac{3}{4}$ hour. 80 marks. Answer *three* questions, including the *first* if you can.)

1. What do you understand by (*a*) a natural boundary, (*b*) an artificial boundary? Give instances of both from the map of Europe, and point out the different influences they possess on the countries they separate.

2. Give some account of the races of people inhabiting Europe.

3. What are the chief vegetable productions of India? Which of them are cultivated mainly for export?

4. Say all you can about Portugal *or* Ceylon. (Draw a sketch-map.)

5. Where, what, and for what noted, are the following:—The Vatican, the Kremlin, Wei-hai-wei, the Hooghly, Kowloon, Baku, Stromboli, Sir Daria?

History.

(Time, $\frac{3}{4}$ hour. 80 marks. Answer *three* questions, including the *first* if you can.)

1. Give some account of the decay of Feudalism in England.

2. What were the chief provisions of the Magna Charta?

3. Mention half a dozen important statutes passed prior to 1486, and give a detailed account of one of them.

4. Draw a genealogical table showing the Houses of York and Lancaster.

5. Who were the following:—Odo, Flambard, Jack Cade, Gaveston, and Sir Thomas More?

English.

(Time, $\frac{3}{4}$ hour. 80 marks. Answer *three* questions, including the *first* if you can.)

1. Analyse the following, and parse words in italics:—

> "Represt ambition struggles round her shore
> *Till*, overwrought, the general system feels
> Its motion stopped, or frenzy *fire* the wheels.
> Nor this the *worst*. As Nature's ties decay,
> As duty, love, and honour fail *to sway*,
> Fictitious bonds, the *bonds* of wealth and law,
> Still gather strength and force unwilling awe."

2. "This favourite good begets peculiar pain." How does Goldsmith show this in the case of England?

3. Write notes on:—Damien's bed of steel; lords of human-kind; Arcadian pride; famed Hydaspes.

4. "My prime of life in wandering spent and care." To what extent was this correct?

5. Point out the various uses of the infinitive mood, and give examples from the poem.

Music.

(Time, 15 minutes. 15 marks. Answer *three* questions.)

1. What intervals are formed by each of the following notes with others:—

r m .fe d

2. Write the following without change of key:—

d m ^{1}m r d t$_{1}$ f s m ^{4}f m r d

3. Rewrite the following in two-pulse measure, halving the value of each note and rest:—

| d :-. | m.f : s.f | m : ' | d^{1} :-.t | l : s.f | m :r. | d :- ||

Arithmetic.

(Time, 1 hour. 100 marks. Answer *three* questions. The *first* is more highly marked than the others.)

1. Point out the advantages of the metric system, and show how each of the units is derived from the metre.

Taking the third class fares at $\frac{3}{4}$d. per mile and 10 centimes per kilometre respectively, for how many francs less could a person travel 350 miles on an English railway than on a French one?

2. If 5 men or 8 women can do a piece of work in $22\frac{1}{2}$ days, in what time will 8 men and 5 women do a piece of work twice as great?

3. A tradesman who is selling off makes a reduction of 10 per cent. from the marked prices. At what price should he mark an article for which he is to receive £1, 11s. 6d.?

4. A makes an article and sells it to B, B sells it to C, C sells it to D for 35s.: A makes 20 per cent.; B, 25; C, 40 per cent. What did it cost A?

5. A certain sum of money at simple interest amounts to £414, 7s. 6d. in 3 years, and to £440, 12s. 6d. in 5 years. Find the sum and the rate of interest.

Composition.

(Time, 30 minutes. 40 marks.)

Write a short essay on the Life of Goldsmith *or* the contents of *The Traveller*.

Euclid and Algebra.

(Time, 1 hour. 100 marks. Answer *two* questions in each.)

1. Define parallel lines, a circle, axiom, postulate, corollary. Write out the corollaries in Props. 1–26.

2. The exterior angle of a triangle is greater than the interior and opposite angle.

3. Of the straight lines which can be drawn from a given point to a given straight line, the perpendicular is the shortest; and of the others, that which is nearer the perpendicular is less than one more remote.

1. Find the numerical value of—

$$\frac{a^3 + b^3}{a^2 - ab + b^2} + \frac{a^3 - b^3}{a^2 + ab + b^2},$$

where $a = \frac{1}{2}$ and $b = 2$.

Simplify $a(2b + 3c) - \{c(2a + b) - b(c - 2a)\}$.

2. Divide $x^3 + (4ab - b^2)x - (a - 2b)(a^2 + 3b^2)$ by $x - a + 2b$.

Solve—

(i.) $\frac{x-1}{7} + \frac{23-x}{5} = 7 - \frac{4+x}{4}$.

(ii.) A and B began trade, A with 3 times as much stock as B. They each gain £50, and then 3 times A's stock is exactly equal to 7 times B's. What were their original stocks?

Elementary Science.

(Time, $\frac{3}{4}$ hour. 100 marks. Answer *three* questions.)

1. Explain clearly the difference between heat and temperature. What is meant by a "unit of heat" and "capacity for heat"?

2. Give clear directions for making and graduating a mercury thermometer.

3. Explain, with the help of a diagram, the changes of bulk when ice at -10C° is heated till it passes off in steam.

4. Draw a diagram of the apparatus by which it is shown that

white light consists of seven colours—(*a*) by decomposition, (*b*) by synthesis.

5. What is meant by latent heat? How can you determine the latent heat of steam? Why is a scald from steam worse than one from boiling water?

SECOND YEAR.

Geography.

(Time, ¾ hour. 80 marks. Answer *three* questions, including the *first* if you can.)

1. What do you know of Australian Federation? What other large colony is a federation of states? Say what you can of its government.

2. Give your opinion as to the suitability of the Orange River Colony and the Transvaal as a field for colonisation.

3. Mention ten of the most important cities in the United States. Give their position, and any interesting facts you know about them.

4. Where and what are the following:—La Plata, Titicaca, Tchad, Eyre, Great Barrier Reef, Banks Peninsula?

5. Give in the form of a table—(1) the names of the countries in South America; (2) their forms of government; (3) their capitals; and (4) chief exports.

History.

(Time, ¾ hour. 80 marks. Answer *three* questions, including the *first* if you can.)

1. Point out the chief constitutional changes since 1603.

2. What do you consider the ten most important statutes passed since 1603? Give dates, and write an account of one of them.

3. Explain briefly—the South Sea Bubble; the Reform of the Calendar; the Chartists.

4. What do you know of the Crimean War?

5. Write brief notes on the following:—Sacheverell, Dean Swift, Bacon, and Rowland Hill.

English.

(Time, ¾ hour. 80 marks. Answer *three* questions, including the *first* if you can.)

1. Analyse the following, and parse words in italics:—

"I, that denied *thee* gold, will give my heart;
Strike *as* thou *didst* at Cæsar; *for*, I know,
When thou didst hate him *worst*, thou lov'dst him better
Than ever thou lov'dst Cassius."

2. Explain the following words and phrases:—*Drop by lottery, arts and imitations, men cautelous, the replication, humour, I am constant as the northern star.*

3. What do you know of Até, Æneas, Epicurus, the Lupercal, Cicero?

4. Give instance of half a dozen of the commonest errors in the written and spoken language.

5. Point out when and how there have been great additions of foreign elements to the English language.

Composition.

(Time, 30 minutes. 40 marks.)

Write a short essay on The character of Cassius, *or* on The reasons why Shakespeare is considered the greatest of dramatists.

Music.

1. Point out the difference in structure between the major and minor scale, and how the upper tetrachord of the latter is written.

2. Explain the following terms:—*Calando, a tempo, marcato, con brio, andante*, M 60.

Arithmetic.

(Time, 1 hour. 100 marks. Answer *three* questions, including the *first* if you can.)

1. Define multiple, common measure, recurring decimal, true discount, and give an example of each.

Divide 73,436 by 105, using the method of factors. Explain how you calculate the remainder.

2. The true discount on a bill due 8 months hence at 2½ per cent. is £176, 14s. 8d. Find the amount of the bill.

3. Taking two steps a second, each step being 2 feet 9 inches long, I walk a certain distance in 3⅓ hours. In what time shall I walk the same distance if I take 132 steps a minute, and each step is 2 feet 10½ inches long?

4. How often can you take $\frac{5}{7}$ from 13⅓? What will be left?

5. A room 20 feet long, 15 feet wide, has a carpet in it, a border 2 feet wide all round being left uncovered by the carpet, and this border was painted at 2s. 3d. per square yard. The price of the carpet was 4s. per square yard. Find the total cost.

Euclid and Algebra.

(Time, 1 hour. 100 marks. Answer *two* questions in each.)

1. The opposite sides and angles of a parallelogram are equal to one another, and the diameter bisects them—that is, divides them into two equal parts.

2. Construct a triangle, having given two sides and an angle opposite to one of them, and show that there may be two solutions, one, or none.

3. ABC is a triangle in which AB is greater than AC. The bisector of the angle A meets the base in D. Show that the angle ADB is an obtuse angle.

1. Find the G.C.M. and L.C.M. of—

(i.) $x^2 + x - 30$, $x^2 + 11x + 30$, $x^2 - x - 42$.

(ii.) $x^3 + 2x^2y + 2xy^2 + y^3$ and $x^4 - x^3y - xy^3 + y^4$.

2. Solve—

(i.) $\frac{x-1}{x-3} + 2x = 12$.

(ii.) $\begin{cases} 7x - 2y = 14 + \frac{x}{2}. \\ 7y - 2x = 32 + \frac{y}{3}. \end{cases}$

3. A company at an inn had £7, 4s. to pay, but before the bill was settled three of them left the room, and then those who remained had 4s. apiece more to pay than before. Of how many did the company consist?

Elementary Science.

(Time, ¾ hour. 100 marks. Answer *three* questions.)

1. Explain clearly the difference between a mixture and a chemical compound.

2. Describe experiments to show the composition of water—(*a*) by analysis, (*b*) by synthesis.

3. Say what you can of the preparation and qualities of CO_2.

4. What are magnetic elements? How would you make a strong and permanent magnet?

5. How could you separate the constituents of gunpowder?

SCHOLARSHIP EXAMINATION, 1900.

Eighth Month—August.

WORK TO BE PREPARED.

1. *Reading, Repetition, and Penmanship.*—A few minutes' practice daily.

2. *Theory of Teaching.*—Chap. xi., *Scholarship School Management.*

3. *Geography.*

(1.) Revise Africa: French Congo, Congo Free State, German East and West Africa, Transvaal, and the Orange River Colony.

(2.) British North America; physical features, climate, and productions.

4. *History.*—George I., George II., and George III., with the history of the Colonies during that period. (Use *The Building of the British Empire*—Holden.)

5. *Composition.*—One or two essays each week, on such subjects as—The Paris Exhibition; The Crisis in China; Social Life in the Times of the Stuarts; Nursing; The Lake Poets; Your Favourite Author; Flowers and their Uses; "The love of money is the root of all evil."

6. *English.*

(1.) Figures of speech.

(2.) Twenty roots and meanings per week.

(3.) Chief writers in the last half-century.

(4.) *Julius Cæsar*, Act v., Scenes 1 and 2.

7. *Arithmetic.*—Involution; measurement of areas and solids. (Chaps. xlvii.-xlix., Christian and Collar.)

8. *Algebra.*—Arithmetical progression.

9. *Euclid.*—Book II., Props. 9–12, with six deductions per week.

10. *Elementary Science.*—The chemistry of the common metals, lead, copper, etc.

11. *Languages.*

Latin—*Pliny's Letters*, No. 9. Translation and retranslation. Exercises in grammar and composition.

French—*Le Trésor*, three pages. Translation and retranslation. Exercises in grammar and composition.

12. *Drawing.*—A freehand copy each week, and exercises in geometry.
13. *Music.*—Chap. viii., *School Music Teacher.*
14. *Domestic Economy.*—Thrift.

Notes on the Work for the Month.

1. *Geography.*—In revising Africa, special attention must, of course, be paid to the Transvaal and Orange River Colony. Questions as to their extent, climate, productions, suitability as fields for colonisation, are quite likely. With regard to the latter point opinions are widely divided. All the parts most useful for pastoral or general agricultural purposes are taken up by the Boers. The greatest defect of the veldt is the absence of a permanent water supply. Given this, and the wilderness blossoms as a rose. It therefore seems probable that much capital will have to be expended in irrigation and boring works before a very large proportion of the land can possibly be habitable. But this is not an insuperable difficulty. The Mormons of Salt Lake City, the fruit-growers of Arizona, California, and the Murray basin, have shown what a revolution can be made by artificial watering; and no better investment has been made in India than what has been expended in irrigation works.

The Cape to Cairo Railway will make a great difference when it is completed and has ramifications in all directions.

Of the other states, the Congo Free State should receive most attention.

The physical features of British North America must be prepared with care, as they influence to no small extent the climate and productions. The magnificent system of natural water-ways is playing to some extent at present, and will play still more so in future, an important part in development. The climate is, of course, varied with the different localities. The Pacific slope, the plateau region, the wide prairies, the icy north, the warm peninsula between Huron and Erie, the cold, foggy regions round the mouth of the St. Lawrence, and the Atlantic coast, have each their particular climate. Much valuable information can be obtained from the handbooks issued by the Agent-General for Canada and the Central Pacific Railway *gratis*, and the student is advised to study these for the most recent statistics.

2. *History.*—This period, though somewhat long, should be fairly easy to prepare, since the work is merely a recapitulation of last year's work.

Students are advised to read as widely as possible after making sure of the absolute facts. Scholarship candidates should display a wider and deeper knowledge than pupil teachers, and should be able not only to give an account of any event, but also to trace the causes leading to and the results accruing from it. The principal points have before been noticed, but attention should be given to the political disturbances in the reign of George I. and of George II., the long sway of Walpole, the far-reaching effects of the Seven Years' War, the reckless and blind policy which led to the loss of the American Colonies, the industrial revolution which took place towards the end of last century, the upheaval in France, and the Napoleonic Wars.

The history of the Colonies is also very important. Every student should obtain the text-book recommended. The development of our power in India under Clive and Hastings, the conquest of Canada, the loss of the States balanced by the opening of Australia, are very important. It is interesting also to notice the low esteem in which the Colonies were held. India was merely a place to make money (read Macaulay's Essays on Clive and Hastings, and note the contempt with which the nabobs were spoken of in England). Australia was merely a dumping ground for criminals, and little attention was paid to Canada. The acquisition of the Cape was regarded by the home authorities as a necessary evil, and few, if any, of the politicians of the last century ever dreamed of such an oversea Britain as we now possess.

3. *English.*—Prepare brief lives of the greatest writers of the last half-century, and learn something of their chief works.

The figures of speech which should be thoroughly understood are—*Simile, Metaphor, Allegory, Metonymy, Synecdoche, Antithesis, Epigram, Hyperbole, Irony, Euphemism, Personification,* and *Apostrophe.* Any ordinary text-book will explain these.

4. *Arithmetic.*—The measurement of areas and solids must receive attention.

Remember length multiplied by breadth gives *area*, area multiplied by depth gives *cubic content.* Conversely, *cubic content* divided by height, length, or breadth gives *area*, or divided by area gives linear dimension. In the majority of cases it will be necessary to draw a diagram to make the problem clear. The area of paths inside or outside a rectangle is a favourite topic for questions. Study carefully the chapters set.

5. *Science.*—A notebook must be kept in this subject. In dealing with any element or compound, the notes should be arranged under the following heads:—

(1.) Symbol, atomic weight, valency.
(2.) Occurrence—(*a*) free, (*b*) in combination.
(3.) Method of preparation.
(4.) Properties deduced from experiment.

6. *Domestic Economy.*—The term "thrift" includes—

(1.) Reasons for saving money.
(2.) Methods of investing money—for example, Post Office Savings Bank, building societies, co-operative societies, life insurance, annuities (immediate and deferred), shares in industrial undertakings, etc. The working of each of these must be understood. The student should note the distinguishing marks of a *good* investment.

Test Questions.

1. *Penmanship.*
Large Hand:—*Orange River Colony.*
Small Hand:—*The abuse of greatness consists in disjoining remorse from power.*

2. Say all you can of Morocco.

3. What possessions have we on the West Coast of Africa? In what way are they valuable to us? Account for the recent trouble in Ashanti.

4. Write an essay of about twenty lines on the foreign policy of Charles the Second, comparing it especially with that of William the Third.

5. What were the constitutional points which were settled at the Revolution?

6. Give some account of the political parties in the time of Anne.

7. Draw up a few simple rules, such as you would give to an upper class of children, on punctuation.

8. Give in your own words the argument arising from the question, "What do you think of marching to Philippi presently?"

9. Analyse the following, and parse words in italics:—

"*With meditating* that she must die *once*,
I have the patience *to endure* it now.
Even so great men great losses should endure."

10. Work the following test paper in Stocks and Shares:—

(*a*) What would be the half-yearly dividend from an investment of £3,300 in the 3½ per cents., made when the stock is at 91? Ans. £58, 18s. 6⅔d.

(*b*) The three per cents. being at 93, determine the interest obtained on money thus invested.
Ans. $3\frac{7}{31}$ per cent.

(*c*) If I transfer £1,000 from 3 per cent. stock at 92 to a 4 per cent. stock, and gain £1, 5s. in income, find the price of the latter stock. Ans. $117\frac{1}{2}$.

(*d*) If the 3 per cents. are at $92\frac{3}{8}$, and the 4 per cents. at $123\frac{1}{4}$, what sum is one investing when the difference is 1s.? Ans. £457, 5s. $1\frac{13}{19}$d.

(*e*) What must be the market value of 3 per cent. stock in order that, after deducting income-tax at 7d. in the £, it may yield 3½ per cent. interest?
Ans. $83\frac{3}{14}$.

11. Explain the preparation of sulphuric acid. What is the difference between a sulphate and a sulphite?

12. What are the qualities which are necessary in a good nurse? *or*, Give some instructions as to diet for sick persons.

CORRESPONDENCE: RULES.

To ensure an answer in the next issue, queries must be sent by the 15th of each month.

Name and address of sender, with coupon of current number of THE PRACTICAL TEACHER (and *nom de plume* if desired), must be enclosed.

As a rule, all replies will appear in the Correspondence Column; but any one desiring an immediate reply may obtain it by enclosing a stamped addressed envelope.

All communications and queries with regard to the PUPIL TEACHERS' AND SCHOLARSHIP COURSE should be addressed to "Mr. A. T. FLUX, The Bays, Belvedere, Kent."

ANSWERS TO CORRESPONDENTS.

Semiramis.—Essay, 15/20. Not enough contrast made between the two periods.

Khaki.—Essay fairly good—14/20. Penmanship, 13/20. Much too crowded; lacking in delicacy and style.

All others answered by post.

OUR CERTIFICATE COURSE FOR 1901.

BY GEORGE COLLAR, B.A., B.SC.,

Head-Master of the Stockwell Pupil Teachers' School.

TEST QUESTIONS ON LAST MONTH'S WORK.

Our readers should always make a point of testing themselves by writing answers to the questions set. Questions sometimes seem easy at first sight, but difficulties arise when the student begins to *write* his answer. Our questions are also set with the hope of leading our readers to study the whole of their course thoroughly, so that they may be able to answer questions on any part.

Theory of Teaching.

Second Year.—1. Explain fully what is meant by the phrase "teaching a child his letters."

2. What steps do you take to ensure that your pupils understand what they are reading?

3. Write a short account of Froebel's life.

Arithmetic.

Both Years.—1. Give the mental work involved in working 43815—15278 by the method of "complementary addition." What are the advantages of "complementary addition" over the other methods of teaching subtraction?

2. How would you explain to children that division by factors produces (*a*) the correct quotient, (*b*) the correct remainder?

English Grammar.

First Year.—1. Define the "predicate" of a sentence, and show that the term must include everything that is not included under the "subject."

2. Quote lines from the *Lyra Heroica* (pp. 1–40) on the subjects of "liberty" and "resignation."

Second Year.—1. Summarise the chief events of Macaulay's boyhood.

2. What are the chief characteristics of the class of poetry to which *Paradise Lost* belongs? Name other poems of the same class.

Geography.

Both Years.—1. Describe the effects of the Hunnish invasion.

2. Say what you can of the conquest of parts of Europe by the Turks.

History.

1. What were the real causes of the French Revolution, and how did it differ from other revolutions which have taken place?

2. Name some of the abuses which the leaders of the Revolution determined to abolish.

French.

1. Translate:—

A l'extrémité de vastes campagnes, dont une partie est labourée et l'autre est en jachère, s'élève un grand château où aboutissent plusieurs avenues; sur le devant, à gauche, est une portion de forêt au milieu de laquelle on voit un défriché, et au milieu de ce défriché une cabane entourée de vergers et de petites cultures; l'entrée du sentier qui y conduit est fermée par une barrière appuyée au tronc de deux saules.

2. Give examples of the four ways in which nouns and adjectives in *-eur* form their feminine.

HINTS AND SYLLABUS OF WORK FOR AUGUST.

English Composition.

Prepare essays on the following:—

1. Is Life worth Living?
2. Britannia needs no Bulwarks.
3. Honesty of Purpose.

Theory of Teaching.

Second Year.—The teaching of spelling and word-building.

Summarise the difficulties and the ways of dealing with them, taking first the *general* difficulties, such as those arising from the language not being phonetic, then the special ones. Notice the two aspects of "word-building"—(i.) in which regard is had chiefly to *sound*; (ii.) in which the importance of the *meaning* of several parts of the word is recognised. The first is practically a development of the "Phonic Method" of teaching reading. The latter is a very sound method of guarding against spelling-errors, inasmuch as it is based on the association between form and meaning. The teaching of Latin and Greek roots to children who never learn any more of these languages is liable to lead to "cram."

Logic.—Language as the instrument in reasoning: terms, their kinds. Logical equivocation arises from the use of a term which has two meanings (or is ambiguous) in such a way that the statement is correct for one meaning, and is assumed to be correct for the other. It is also very important to form a clear idea of what is meant by the "intension" and "extension" of a term, and to see that as one increases so the other must diminish. The chapter on the growth of language (Jevons, vi.) deserves careful study, and must be supplemented by the grammar books. Study carefully Jevons, iii.–vi., and Welton, ii., iii.

Froebel: Section I.—The Nursling. Read carefully and make an analysis, and note maxims or aphorisms.

Arithmetic.

The Compound Rules and methods of teaching them: particulars in which they differ from the simple rules. Explanation of multiplication by factors. Importance of insisting on the fact that the remainder in compound division is not an abstract number, but a number of units of the same order as those last divided.

Theory of numbers preparatory to the study of vulgar fractions. Study carefully chap. xvii.–xix. in Christian and Collar's *Arithmetic*.

English Grammar and Literature.

First Year.—Last month we gave what must be admitted to be a logical method of analysing a "simple sentence." We now proceed to deal with compound and complex sentences. A compound sentence is one that is formed by joining two simple sentences. Hence the only new element is the connective; the principal parts are treated as simple sentences. Some recommend a separate column for the connecting words; but, as a matter of fact, a word which simply joins two sentences does not form a part of either, and students are advised to bracket off connecting words, whether they join together co-ordinate sentences or join a subordinate sentence to its principal.

Some grammarians indulge in fierce controversy over the name which should be given to the parts of a complex sentence—that is, whether we should speak of subordinate *sentences* or subordinate *clauses*. The question, however, is not of much importance, and depends entirely upon the definition we give of a "sentence" to start with. If we say that "a sentence is a complete thought expressed in words," then obviously the members of a complex sentence are not themselves sentences; but if we regard a sentence as a group of words capable of stating a truth, then the use of the expressions "noun sentence" and "adverbial sentence" are allowable.

The student is already familiar with the fact that there are three kinds of subordinate sentences, and that they are named respectively, noun sentences, adjectival sentences, and adverbial sentences, from the part of speech for which they are substituted. There is, however, a general lack of system in indicating the relation between one sentence and another, especially when the subordination extends through more than two degrees. The following example shows the method of indicating the relation between sentences:—

I shot an arrow into the air:
It fell to earth, I know not where;
For so swiftly it flew, the sight
Could not follow it in its flight.

Sentence.		Kind and Relation.	Subject.		Predicate.		
			Nom.	Enlar.	Verb.	Completion	Exten.
A	I shot an arrow into the air	Simple.	I		shot	an arrow (*dir. obj.*)	into the air (*place*).
B	I know not	Principal.	I		know	(*a*)	not (*neg.*). (*b*) (*cause*).
(*a*)	[Where] it fell to earth	Noun, obj. of B.	it		fell		to earth (*place*).
(*b*)	[For] so swiftly it flew	Adv. mod. *know* in B.	it		flew		so swiftly (*manner*). (*i*) (*result*).
(*i*)	The sight could not follow it in its flight.	Adv. of conseq., mod. swiftly in (*b*).	sight	the	could	follow it in its flight (*dir. obj.*)	not (*neg.*).

In the above it will be seen that,—

(i.) The same kind of letter is used for sentences which are co-ordinate.

(ii.) Successive subordinations are shown by a scale of signs—for example, capitals, small letters, Roman numerals; which might be followed by Arabic numerals, etc.

(iii.) The sentence B has two subordinate clauses, (*a*) a noun sentence, and (*b*) an adverbial one. But (*b*) itself is complex, and its subordinate clause is marked (i).

Lyra Heroica. Next ten selections.

SECOND YEAR.—Macaulay's *Life and Letters*, chap. iii., iv. *Paradise Lost*, I., lines 331–621. See notes in last year's PRACTICAL TEACHER.

GEOGRAPHY.

BOTH YEARS.—The settlement of the British Isles after the break-up of the Roman power is well known to our readers. But matters were rather more complicated in the western part of the Continent. The Teutonic tribes who overthrew the Roman power in Gaul were the Visigoths, Burgundians, and Franks, the latter of whom gave their name to the country. While these were establishing themselves in Gaul, the Saracens crossed into Spain, and made themselves masters of that peninsula. This Moorish invasion passed to the north of the Pyrenees, and threatened the whole of Western Europe. It was, however, checked near Poictiers by Charles Martel. The vast importance of this battle is well set out in Creasy's *Fifteen Decisive Battles of the World*, which the student should read. The Frankish dominion attained its greatest power under Charlemagne (or Charles the Great), who made himself master of nearly all Germany, Belgium, France, Switzerland, the north of Italy, and north of Spain, although his advance in the latter country was keenly contested by the Moors. Charlemagne was crowned on Christmas Day 800, by Pope Leo the Third, and his dominions were afterwards called the "Holy Roman Empire." His weak successors nearly ruined the empire by their quarrels. One son, Lothaire, was vanquished by his brothers Charles and Louis (whose oath of alliance—the oath of Strasburg—is the oldest literary monument in the French language), and was obliged to agree to the Treaty of Verdun, by which the heritage of Charlemagne was divided into three. The title of emperor was reserved to Lothaire, who received the central parts of the dominions—that is, the east of France, which was called from him Lotharingia (now corrupted into Fr. *Lorraine*, and Ger. *Lothringen*). Italy and the Netherlands were joined to his possessions. Louis (called the German) received the part east of this, and Charles the Bald received that part of France which lay to the west of Lothaire's empire. From this time France and Germany became separate, and although each for a long while consisted of a collection of almost independent provinces, yet each tended to assume the condition in which we find them in 1789. In France the feudal lords were almost independent, but the policy of successive sovereigns—especially of the crafty Louis the Eleventh—was to reduce the power of the vassals and increase their own. The changes in the frontiers in the reign of Louis the Fourteenth were considered in last year's notes.

Germany became an independent state, its head being crowned, like Charlemagne in earlier days, the temporal chief of the Holy Roman Empire. After the death of Louis the German, and his son, Charles the Fat, Germany was divided; but in 936 Otto the Great appeared, and under him Germany may be said to have definitely taken the place which it was to hold in modern Europe. He strengthened his own empire, and delivered Europe from the misery of a great Magyar or Hunnish desolation. Otto's victory put an end to the predatory habits of the Magyars, and was the first step in making them into the Hungarian kingdom. From the time of Otto, the German kings claimed from the Pope the imperial crown as their right; but they never failed to receive also a German crown at Aachen or Frankfort to typify their headship over the German lands and men. But although the empire lasted, its power was a very varying quantity as compared with the power of its constituent states. The country, in fact, was in the hands of princes who strove with one another under the protection of foreign alliances, especially of France.

The Thirty Years' War led to considerable modifications in the extent of the Germanic states: France took Alsace, Sweden took Pomerania, Holland and Switzerland became independent.

In the last half of the seventeenth century and the beginning of the eighteenth three treaties were concluded with the French, by each of which Germany lost territory.

Spain and Portugal. We have already referred to the conquest of the north coast of Africa by the Saracens, who crossed the Straits of Gibraltar, and in 710 subjugated the Visigoths, who for two centuries had been masters of the peninsula. In 719 they invaded France, made themselves masters of Narbonne, Carcassone, and Bordeaux, but were overthrown between Poictiers and Tours by Charles Martel. But overthrown as they were in France, they were able to maintain their hold in Spain until the twelfth century; but for the last two centuries of their domination their power was weakened by divisions, so that they were unable to resist the attacks of the Spaniards, who wrested from them one province after another, although it was not until the provinces of Castile and Aragon had been united by the marriage of Ferdinand of Aragon to Isabella of Castile that the Spaniards were able to conquer Granada, and thus complete the overthrow of the Moorish power in Spain (1492).

Portugal was under the rule of the kings of Spain from the days of Philip the Second to 1640, since which time it has remained independent.

The student should read Freeman's *First Sketch of European History*, as it is of the first importance that he should have a clear understanding of the way in which the different states came into existence, and have attained the relative sizes. It is also advisable to read *The Moors in Spain*, *Germany*, and others of the interesting volumes in "The Story of the Nations" series. They will be found in most of the public libraries.

HISTORY.

BOTH YEARS.—The "Constituante," which had drawn up the new constitution on monarchical lines for France, dissolved itself September 30, 1791; and the "Legislative Assembly," which was elected to carry out the ideas of the "Constituante," met the next day. The history of this body is practically the history of the downfall of monarchy. It professed to maintain the king, but really worked to diminish both the real power and the outward signs of royalty. It decided at once that the titles of "Sire" and "Majesty" were not to be given to the king. They had to face a threatened insurrection from within, and an invasion, organised by the "emigrants," from without; and, moreover, the members of the Legislative Assembly were bitterly opposed among themselves.

Seeing that Leopold of Austria was preparing to invade France, the ministry obliged the king to declare war against Austria, and, under Dumouriez, the French invaded the Austrian Netherlands; but owing to the lack of experienced officers, most of whom had emigrated, and the want of subordination among the troops, they were defeated and driven back into France. Louis the Sixteenth opposed the measures taken by the ministers to meet this invasion; but the mob entered the Tuileries, and obliged the king to wear the "red cap," although he refused to sanction the decrees. The Prussians, on July 25, 1792, invaded France from the north-west; but the "manifesto" issued by the Duke of Brunswick, their commander, only incensed the French more against the king, who was suspended from his functions by the Legislative Assembly and imprisoned. From August 10, thousands of persons suspected of sympathy with the king were imprisoned; and then the Legislative Assembly itself fell under the power of the Commune of Paris, by whose authority, in the early days of September, ruffians were sent into the prisons to murder those within. While these terrible "Massacres of September" were in progress, the national army was bravely trying to check the invasion of the Austrians and Prussians, and on September 20 the latter were signally defeated at Valmy.

The day after this victory the "Convention" replaced the Legislative Assembly, and France was proclaimed a republic.

The members of the Convention formed three main groups: (1) The Girondins; (2) the Mountaineers (Montagnards); and (3) the Plain; and the chief power was acquired by each party in turn. The Girondins wished to save the king, and to avoid excessive centralisation of power; but they showed weakness in carrying out their plans, particularly in the prosecution which they instituted against the three "Mountain" deputies—Marat, Danton, and Robespierre. In spite of the wishes of the Girondins, the king was tried and executed January 21, 1793; and such was the feeling against the Girondins that thirty-four of them were imprisoned. The military operations had meantime been successfully conducted on the frontiers. Dumouriez had followed up his success at Valmy by driving the Prussians across the Rhine; one of his lieutenants had captured the fortress of Mayence; while in the north the Austrians were obliged to raise the siege of Lille; and after the victory of Jemappes the French became masters of Belgium south of the Meuse, and in the south they conquered Savoy and Nice.

After the execution of Louis the Sixteenth, the French declared their intention of overthrowing monarchies wherever found, and called upon the people of such countries to rebel. This led England, Holland, Naples, Spain, and the various German states to ally themselves with Prussia and Austria. Then came a period of reverses for the arms of the new republic. Mayence was retaken by the Prussians; the French lost Condé and Valenciennes, and were driven out of Belgium; while the

Spaniards poured through the Pyrenees. To add to the difficulties of the Convention, insurrections broke out in all parts—particularly in Brittany, La Vendée (or the country round the mouth of the Loire), and at Lyons and Toulon. The insurgents received very material aid from the British ships, against which the French navy, which had been allowed to fall into a terrible state from want of officers and stores, was quite powerless. For a time, also, a British fleet held the ships and arsenal of Toulon in aid of the insurgents.

To combat the difficulties with which they were threatened, the Montagnards appointed an executive committee of five members, afterwards increased to twelve, known as the "Committee of Public Safety." This committee was armed with practically absolute power, which was freely used against all opponents.

Under such a strong government success again came to the republican arms. The English were beaten at Houdschoote, and compelled to abandon the siege of Dunkirk. Jourdan and Hoche drove back the Austrians and Prussians, and cleared the north and east of France from invaders. The insurgents were also overcome in quick succession. Lyons was taken after a siege of sixty-three days. Then the British admiral, seeing that Toulon could not hold out much longer, withdrew, and the town fell to the troops of the Convention. Napoleon Bonaparte, a captain in the artillery, first distinguished himself in the siege of Toulon. Under the skilful direction of Kleber, the Vendean insurrection was suppressed in 1793, and the pacification of the district was completed in 1795 by Hoche. In the following year (1794) France resumed the offensive. Pichegru, at the head of the "Northern Army," defeated the Austrians at Mouscron and Turcoing, near Lille. Jourdan then came up on their left flank with the "Army of the Moselle," forced the passage of the Sambre, captured Charleroy, and routed the Austrians in the great battle of Fleurus. The English army, being then unable to join the Austrians, was obliged to retire to Holland; and so Belgium once more fell into the hands of the French.

But though the "Mountaineers" by their ferocious vigour had put down rebellion at home, and secured so many military successes beyond the frontiers, they did not reap the results of their labours. They were split into three factions, at the head of which were Hébert, Danton, and Robespierre respectively. The Hébertists made war on Christianity, and set up the goddess Reason; they fell before a charge of atheism. The Dantonists wished that the indiscriminate executions should end with the national peril; they fell before a charge of reaction and Orleanism. The followers of Robespierre, strengthening their position by abolishing the last guarantees of those accused of political offences, were deserted by some of their friends, who joined the "Plain" in overthrowing them. Thus the "Reign of Terror" came to an end with the execution of Robespierre, July 27, 1794.

The successes of 1794 were followed up by the French generals. The English troops were unable to resist the advance of Pichegru, who entered Holland, took Amsterdam, and seized the Dutch fleet, which was ice-bound at Texel. Jourdan drove all the Austrians to the east of the Rhine, so that the whole of that river from Basle to the mouth was in the hands of the French. In April 1795, Prussia signed a treaty at Basle by which she ceded to France all possessions west of the Rhine; and in July of the same year Spain secured peace by a treaty, drawn up also at Basle, by which she ceded to France her possessions in San Domingo. England, Austria, and Sardinia were the only countries now remaining in arms. The immense importance of British supremacy at sea began now to show itself; for although the assistance afforded to the emigrants who returned to Quiberon Bay did not enable them to resist the forces of Hoche, the French were defeated in small engagements in the East and West Indies, and particularly in the open Atlantic by Lord Howe in the battle named after its date, "The Glorious First of June."

The "Plain" and other members of the Convention who rallied round them after the fall of Robespierre adopted a conciliatory policy, and set about preparing another new constitution. This was the "Directorial Constitution," in which the government consisted of—(i.) an executive committee, called the Directory, and consisting of five members, one to retire each year; and (ii.) a legislative of two houses—(*a*) the "Council of the Five Hundred," in which laws were to be proposed, and (*b*) a "Council of the Elders," who possessed the right to veto the laws passed by the lower house. To start the new constitution, two-thirds of the members were elected by the Convention from its own members, the rest by the people.

Algebra.

Women—Both Years.—Multiplication and division. The theory of the "Rule of Signs" must be thoroughly mastered. Students should give themselves abundant practice in mental multiplication. All kinds of binomial expressions should be multiplied mentally; for example—

$$(x + 5)(x + 7) = x^2 + 12x + 35.$$
$$(2a + 5b)(3a + 11b) = 6a^2 + 37ab + 55b^2.$$

The student who has mastered the method of building up these results from their component factors will find little difficulty in resolving such expressions into factors; and this is a most important power to gain.

Men—First Year.—Factors. The following represent the chief classes of factors:—

1. $a^2 + 2ab + b^2 = (a + b)(a + b) = (a + b)^2$.
2. $a^2 - 2ab + b^2 = (a - b)(a - b) = (a - b)^2$.
3. $a^2 - b^2 = (a + b)(a - b)$.
4. $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$.
5. $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$.

(Notice that in 4 and 5 the signs in one factor are all +, and in the other alternatively + and −.)

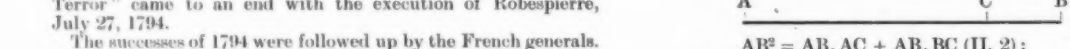
6. $a^2 + (m + n)a + mn = (a + m)(a + n)$.
7. $a^2 + 7a + 10 = (a + 5)(a + 2)$.
8. $a^2 - 7a + 10 = (a - 5)(a - 2)$.
9. $a^2 - 3a - 10 = (a - 5)(a + 2)$.
10. $a^2 + 3a - 10 = (a + 5)(a - 2)$.

Men—Second Year.—Continue miscellaneous examples on back work, particularly on the more difficult classes of factors. Read the chapter on Permutations and Combinations, and work examples.

Euclid.

Women—First Year.—To end of Prop. 7. Notice particularly the relation between 5 and 6, and between 4 and 8. You will see that the hypothesis of the first becomes the consequence in the second, and *vice versa*. When that is the case, one proposition is said to be the "converse" of the other. It is important to notice that when a proposition has been once proved, its converse is generally proved negatively. Thus, in 6 the sides of the triangle must be either equal or unequal; consequently, if we show that they are not unequal, it follows that they must be equal; and it is simple enough to show that they cannot be unequal, as the previous proposition reduces this suggestion to an absurdity.

Women—Second Year.—Book II., Props. 4, 5, and 6. Notice that the fourth proposition can be proved in a very simple way by combining 2 and 3. Thus—



$AB^2 = AB.AC + AB.BC$ (II. 2);
but $AB.AC = AC^2 + AC.BC$ (II. 3),
and $AB.BC = AC.BC + BC^2$; adding these results,
$AB^2 = AC^2 + BC^2 + 2\,AC.CB$.

This method, however, does not enable us to show that "the parallelograms about the diagonal of a square are likewise squares;" and this corollary to Euclid's method is very useful, both in the ordinary way of proving the subsequent propositions, and also in many deductions that may be set on Book II.

Men—First Year.—Revise Book II. Work out the relations that may be established between the propositions if the position of the point be moved—for example, in Prop. 9. See what would result (*a*) when the two points which divide the line coincide with one another; (*b*) when the second point coincides with the extremity of the line; (*c*) when the point is beyond the extremity—that is, is in the line produced. (The last case gives us Prop. 10.) So also we may develop Prop. 13 from Prop. 12.

Men—Second Year.—Complete Book IV. No difficulty will be found except in Prop. 10, which will be readily mastered by working backwards, in order to see *why* the line should be divided in the manner of II. 11.

Latin.

Follow The Practical Teacher Matriculation Course.

French.

Both Years.—Grammar of the pronouns. Read carefully and re-translate selected passages from *Le Roi des Montagnes*, pp. 29–44, Practical Teacher Edition, and work Exercises 3–5.

LONDON MATRICULATION.

JUNE 1901.

BY R. C. B. KERIN, B.A. (LOND.),

First in First Class Classical Honours at Final.

LATIN.

Two papers in Latin, of three hours' duration each, are set. The first paper deals with the prescribed author. Passages are given for translation. Short selections are also made for the candidate to write grammatical, historical, or geographical notes on. A question on parsing is generally given. The quantities of the vowels of words occurring in the prescribed author have sometimes to be marked by the candidate. The second paper consists of—(*a*) questions in grammar dealing with both accidence and syntax; (*b*) sentences to be turned into Latin; (*c*) three pieces of translation at sight—the first in prose, the second and third in verse. There is a choice allowed between the second and third; the first piece is obligatory. Formerly "the translation at sight" was given in the paper in which the prescribed author was dealt with, and candidates were enabled to compensate for defective translation at sight by a thorough knowledge of their "set" author. We recommend the following books:—

(*a*) Sallust, *Catiline.*—Macmillan's elementary edition (edited by Nall) has a full vocabulary and excellent notes.

(*b*) Grammar.—Postgate's *New Latin Primer* (Cassell); Roby and Wilkin's *Elementary Latin Grammar* (Macmillan) are excellent books.

(*c*) Composition.—Bayfield's *Latin Exercises* (Cassell), or Bradley's *Arnold*, or Allen's *First Latin Exercise Book.*

(*d*) Dictionary.—Cassell's, Gepp and Haigh's, or Smith's.

(*e*) Translation at sight.—*Anglice Reddenda*, First Series, by Jerram (Clarendon Press). We also recommend students to read Smith's *Smaller Roman History* for the events which form the subject-matter of Sallust's masterpiece.

LATIN COURSE FOR AUGUST.

1. Sallust, *Catiline*, chaps. i.–ix.
2. Grammar.—Postgate, secs. 1-27, 251-277.
3. *Anglice Reddenda*, Nos. 1-10.
4. Do some sentences each week from one of the books mentioned above. Practice in doing sentences is essential.

Grammar Notes.

Dissyllabic words are accented on the first syllable. Note the rules for the accentuation of polysyllables. The accent is on the penult if the vowel of the penult is long; otherwise the accent is on the antepenult—for example, *amī'cus, amici'tia.*

It is very important to know the genders of substantives, as questions are frequently set thereon. The best way to learn them is to commit to memory the rhymes given in the grammars.

In the first declension, note the archaic form of the genitive *ai*; the words which end in *bus* in the dative and ablative plural; the words ending in *um* in the genitive plural; the declension of *paterfamilias* and *materfamilias.*

In the second declension, note the three neuter words ending in *us*—namely, *virus, vulgus, pelagus.* These words are not used in the plural (except *pelagus*, rarely). As they are neuter, the accusative is the same as the nominative. *Vulgus* is occasionally masculine.

Note the rules for the genitive of words in *ius.* Note the vocatives of *filius, genius*, and proper names in *ius.* Note the words that have the genitive plural in *um*, especially *sestertius*; the declension of *deus.*

In the third declension, know the rules and exceptions for the genitive plural in *um* and *ium.* Note the words which have the accusative singular in *im* and the ablative singular in *i.* In Cicero, words that have the genitive plural *ium* have the accusative plural in *is.*

Note in the fourth declension the words that have (*a*) *ibus*, (*b*) *ubus*, in the dative and ablative plural.

In the fifth declension, note that *dies* and *res* alone have a full plural; the other words have no genitive, dative, or ablative plural.

The lists given in the grammars of the words with different stems should be known.

Among the most important are—*canis, senex, iusiurandum, supellex* (no plural), *bos, Jupiter, linter, ilex, anceps, mos, strix, nox, nix, lis, obses, requies, tellus, dolor, flos, seges, cassis, capis, cucumis, mus, lepus, decor, decus, hiemps, servitus, flamen* (2), *pecten, sus, cor, interpres, gryps, Thetis, elephas, lynx, Arcas, echo, tussis, vis, imber, ŏs, ōs, vas* (*vadis*), *vas* (*vasis*), *ingerum*, (second declension in singular and third in plural), *tigris, pālus* (third declension), *pīlus* (second declension), *vates, aries, cicatrix, crus, classis, pondus, pes* (masculine), *compes* (feminine), *iecur, iubar, calcar, cupedo, dos, incus, olus, caro, iter, Aquinas, aer, tibicen, pectus, pulvis, ver, lac, lapis, nex, scelus, vulnus, semis, carbasus, merces, merx, sitis, mel, haruspex, papaver, calx, rete, Sappho, pecus, nux, pugio, robur, teges, senectus, vomer, vos, vervex, cornix, macedo, chlamys, auspex, cuspis, femur, fenus, cos, dedecus, pumex, trames, securis, paries, comes, sacerdos, poples, cubile, messis, amussis, turbo, crates, poema, viscera, Tyndaris, civitas, cruor, nubes, salix, hirundo, iuvenis, caespes, grus, certamen, genus, tubes, apex, Neapolis, turris, bellus, obex, aetas, cinis, tus, far, caput, pollex, stirps, anas, paro.*

Typical Sentences.

1. "Who can say to him that we were blamed yesterday by the Romans?"

Quis ei nos a Romanis heri laudatos (*esse*) *dicere potest?*

Notes.—(*a*) Beginners very likely will look up in an English-Latin dictionary for the Latin equivalent of *that*, and will find perhaps *ut*, and turn the sentence given above into some such dreadful Latin as *dicere ut culpati essemus.* Now, in Latin, *ut* should never be used after a verb of saying, thinking, telling, perceiving, when in English there is a "that clause" or its equivalent. In Latin you have in such cases to use the accusative and infinitive construction; the subject of the "that clause" will be put into the accusative, and the verb into the infinitive. (This construction of the accusative and infinitive in English is rare, and is chiefly used after verbs of seeing, as, "I saw him do this.") (*b*) The next question that arises is what tense of the infinitive is to be employed. Now remember that in Latin the *present infinitive* is used if the action of the verb in the infinitive is *going on* at the same time as that of the verb on which it depends—for example, "We say that your friend is mad." *Amicum tuum insanum esse* (*furere*) *dicimus.* The *perfect infinitive* will be used if the action of the verb in the infinitive is *antecedent* to that of the verb on which it depends—for example, "We know that your father did this." *Patrem tuum hoc fecisse scimus.* Here the "doing" takes place before the knowledge of the fact. (*N.B.*—There are certain cases when English is ambiguous, and we can use either the present or the perfect infinitive—for example, "He said that your friend was wise," may mean either that your friend was wise at the time he made the remark—which is the more natural meaning—or that he was wise antecedent to the time when the remark was made: in the *latter* case you use the perfect infinitive, in the former the present infinitive. This ambiguity occurs only after a past tense, owing to the English rule of sequence of tenses.) Thirdly, the *future infinitive* is employed if the action of the verb in the infinitive is *subsequent* to that of the verb on which it depends—for example, "He hopes that you will do this." *Te hoc facturum* (*esse*) *sperat.* Generally speaking, the *voice* of the infinitive will be the same as in English, except that in certain cases where the infinitive has an object in the accusative ambiguity might arise, and the Latins use the passive instead of the active—for example, in "We know that Milo killed Clodius," if you wrote in Latin *Milonem Clodium interfecisse scimus*, this might also mean, "We know that Clodius killed Milo," because the order of words in Latin is not fixed. We should therefore, in such a sentence, write, *Clodium a Milone interfectum* (*esse*) *scimus.* (*c*) If the infinitive is made up of a participle and *esse*, as in the future infinitive active and perfect infinitive passive, the participle must agree with the subject of the infinitive. Therefore, in our version given above, *laudatos*, not *laudatus*, is written in agreement with *nos*, which is accusative masculine plural. (*d*) The *agent* after a passive verb is expressed by *a* or *ab*, with the ablative, *not* by the ablative alone, without a preposition. (*e*) *Who* (interrogative pronoun) is expressed by *quis* not by *qui.* (*f*) *Possum*, like *can* in English, is followed by the infinitive. (*g*) *Esse* may be omitted in the future infinitive active and perfect infinitive passive. (*h*) Verbs of telling and saying govern the dative of the person told, *not* the accusative, hence the dative above.

2. "I was threatening to put these men to death with severe tortures as quickly as possible."

Me hos magno cruciatu quam celerrime interfecturum minabar.

Notes.—(*a*) Verbs of hoping (when the hope is future), threatening, and promising are followed by the accusative and the future infinitive, *not* by the present infinitive. This is in accordance with the rule given in 1, as the action of the verb in the infinitive must necessarily be future to that of hoping, threatening, or promising. (*b*) *As*, followed by an adverb and "as possible," will be expressed in Latin by *quam* and the superlative

of the corresponding Latin adverb. Some part of the verb *possum* is understood.

3. "We set out from Rome, and arrived in four days at Capua, where you were stopping.

Roma profecti Capuam, ubi manebas, quatuor diebus pervenimus.

Notes.—(*a*) Very often in Latin you find a participle and a finite verb used where we use two finite verbs connected by "and." The literal translation of the above is, "Having set out from Rome, we arrived....." (*b*) "Motion to" a place is generally expressed by *ad* and the accusative, but in the case of *names* of towns or *small* islands we use the accusative without *ad*—hence *Capuam* above. *At* in English generally denotes *rest in*, but with *arrive* it denotes *motion*. (*c*) "Motion from" is generally expressed by *a* or *ab* with the ablative, but in the case of names of towns and small islands the ablative is used with a preposition, hence *Roma* above, not *a Roma*. (*d*) "Time within which" is expressed by the ablative without a preposition, or by *intra* with the accusative. (*e*) You, if referring to one person only, must not be expressed by *vos*, but by *tu*. (*e*) *Proficiscor* being a deponent verb has a perfect active participle.

Sentences for Practice.

(Readers' solutions, if sent on to the Editor of the Matriculation Course, with 7d. in stamps, will be corrected.)

1. Who can tell you that Cæsar's father has done this well?
2. We hoped to give these books to two sailors.
3. Who promised to set out for Rome in a week's time?
4. We shall tell him that the soldiers caught six fish in the lake.
5. Tell him that your brother was injured (*laedo*) by the consul.
6. No one knows that he will put these men to death.
7. I cannot tell you that he was wise.
8. We hoped that your brother would go to Syracuse (*Syracusae*) as quickly as possible.
9. He set out from Corinth and arrived at Paris (*Lutetia*) in four days.
10. We said that he was wise then, but was no longer so.

ENGLISH.

Two papers are set in English, one dealing with English history, the other with the grammar, history, and literature of the language. Two questions are usually set which involve a knowledge of historical geography; one of these questions is generally obligatory. In both papers a choice of questions is allowed.

Nesfield's *English Grammar, Past and Present*, seems to be the most suitable book for matriculation. Every question that has been set can be answered from it. All the most modern views will be found therein. It also contains a set of matriculation questions covering nearly thirty years. Among other books that are useful for matriculants I may mention Skeat's *Primer of English Etymology* (Clarendon Press. 1s. 6d.). It has an admirable chapter on "Grimm's and Verner's Laws." I know of no clearer exposition of these two *bêtes noires* of matriculants than that contained in this manual. Among other admirable books, I may mention the revised Morris (Macmillan); West's *Grammar* (Pitt Press), an exceedingly clear and lucid book; Professor Meiklejohn's *Grammar*, containing an excellent chapter on prosody.

In history we have an *embarras de richesse*, but of many excellent books before us we may pick out Oman's *English History* (Arnold), Gardiner's *English History* (Longmans), Ransome's *Short History* (Longmans), Arnold Foster's *History* (Cassell), Green's *History* (Macmillan), Tait's Analysis of Green's *History*, *Social Series History* (Allman). Gardiner's *Historical Atlas* (Longmans) should be in everybody's possession.

In literature we recommend Stopford Brooke's *Primer* (Macmillan and Co. 1s.) In addition to this, candidates should read some other works dealing with English literature. There is an excellent book (Lees') published by Blackie and Co.; *Longer English Poems*, edited by Professor Hales, in Macmillan's series, should be also bought. The criticisms of the various poets are very valuable and instructive.

Course for August.

1. Grammar.—Nesfield, Part I., chaps. i. and ii.; Part III., chap. xxvi. to 492.

2. History.—From the beginning to the death of Alfred.

Note the definition of a noun; classification of nouns; personification; different methods of distinguishing genders; masculine words formed from the feminine; history and origin of the various suffixes indicating gender, number, and case; formation of the plural; formation of words like songstress, drake, witch, lord, lady, woman, bachelor, widower, bridegroom, seamstress, vixen, brethren, news, remnants of the old inflections, words with two plurals; words with different meanings in the singular and the plural, secs. 75 and 76; false plurals, sec. 77; double plural endings and words with two plural forms, sec. 73; words only used (1) in the plural, sec. 79, (2) in the singular; the reason why the possessive case has an apostrophe and the plural has not, except in the case of words ending with certain letters of the alphabet; plural of compound nouns; relics of the old possessive inflections—for example, Lady-day, Saturday, etc.; the absolute case in English; the parts of speech that have case; Christ His sake (482); a book of John's. In 479 note the reason why words of separate origin are selected to note the distinction of sex. In 480 the history of the possessive case is clearly traced. In 489 note why some words are the same in the plural as in the singular. Note, 490, plurals that have become singular, and in 491, singulars that have become plurals. Note the explanations given for these grammatical peculiarities.

Note the following points:—The original inhabitants of Britain, their customs, religion, etc.; the various Roman invasions and conquests, with the names of principal commanders and their British opponents; the results of the Roman Conquest (you should be able to draw a map of Celtic Britain); introduction of Christianity into Roman Britain; the five provinces; the Roman officials, especially the Count of the Saxon Shore (you should be able to give an account of the introduction of Christianity by Augustine); note Offa's Dike, the venerable Bede; discuss the question raised as to who was the first king of England; the causes and progress of the various Danish invasions are very important; the battle of Ethandune and the treaty of Wedmore, the Five Boroughs, Danelagh, Guthrum, Hastings, Alfred's legislative, social, and military changes, are of extreme importance; difference between the Roman Conquest and the Anglo-Saxon Conquest is well sketched in Green's *History*; social and political divisions of the Anglo-Saxons; the order of the Anglo-Saxon invasions; Gesiths, Thegns, Aldermen; Hundreds, Tithings, etc.

GEOMETRY COURSE.

The text-book we shall refer to in our course is Hall and Steven's *Euclid*, in which the student will have to read the first four books. In addition to getting up the propositions, the student should work plenty of the riders. A key to the exercises given in Hall and Stevens can be obtained if required. Amongst other Euclids to be recommended are Casey's *Euclid* and that of Hamblin Smith.

This month may be devoted to the study of the definitions and first twenty propositions of Book I.

We append a few riders, to which we shall give solutions next month.

1. Prove I. 20 without producing a side.

2. On a given base to describe an isosceles triangle, having each of its equal sides double the base.

3. ABC, DBC are two triangles equal in all respects on opposite sides of the same base BC; prove that DA is perpendicular to BC.

4. If O be any point outside a triangle ABC, show that the sum of OA, OB and OC is greater than half the perimeter of the triangle. Is this true if O be within the triangle? Discuss the case when O and A coincide.

ARITHMETIC COURSE.

The text-book we recommend is Pendlebury's *Arithmetic*. We shall, of course, assume a fair knowledge of the subject on the part of our readers, and shall start by reading chap. xv. on decimals. Among the important parts are arts. 183 to 188.

We add some questions.

1. Reduce $\frac{4}{13}$ to a recurring decimal, explaining any method you may adopt for shortening the work.

2. Bring $\cdot 13\dot{4}$ to a vulgar fraction, explaining each step of the method employed.

3. Calculate to two decimal places the value of

$$\frac{1}{5\cdot 6} + \frac{1}{5\cdot 6\cdot 7} + \frac{1}{5\cdot 6\cdot 7\cdot 8} + \ldots$$

Note $5\cdot 6\cdot 7$ means $5 \times 6 \times 7$.

4. Find the value of $\cdot 3175$ of 2 cwt. 20 lb.

5. Account for the fact that if from any number—for example, 76451—another number composed of the same digits, but in a different order—for example, 45167—be subtracted, the result is divisible by 9.

ALGEBRA COURSE.

We recommend the use of Hall and Knight's *Elementary Algebra*, to which we shall refer in this course, which we shall commence at simultaneous equations. This month may be occu-

piel in studying chaps. xiv., xv., and xvi., and plenty of the examples worked. The student should be able to write down the square of any expression without any hesitation, so that Ex. xv. (*b*) should be worked through until facility is acquired; xv. (*c*) is also an important set.

We append a few questions.

1. Write down the square of $2x^2 - 3x - 3$ and the cube of $2x - 3y$.

2. Solve $\frac{6}{x} + \frac{2}{y} = 5$.

$$\frac{4}{x} + \frac{1}{y} = 3.$$

3. Three men run a race, and odds are offered against them of 2 to 1, 3 to 1, and 4 to 1 respectively. How much should a person lay on them respectively so as to win £3, 5s. in any event.

4. Solve the equation $(3x - y - 2)^2 + (7x + y - 8)^2 = 0$.

5. Prove that the product of any four consecutive integers increased by unity is a perfect square.

GENERAL ELEMENTARY SCIENCE AND MECHANICS.

For those taking up mechanics we recommend Loney's *Mechanics and Hydrostatics*, and for the general science *General Elementary Science*, by Briggs (U.C.C.).

In the mechanics the appendix to Loney should be read first, as some knowledge of trigonometry is almost essential. At the same time, chap. xii. should be read, and most of the examples worked.

In the general science the first four chapters of the "Mechanics" should be read up, and the first two chapters of the "Light." Arts. 71 and 73 are important.

Note that by an acceleration of 32 ft. per sec. per sec. we mean that every second the velocity of the body is increased by a velocity of 32 ft. per sec.

Note that if a body be thrown vertically up with a velocity u—

(1.) Time of rising = time of falling = $\frac{u}{g}$.

(2.) Greatest height = $\frac{u^2}{2g}$.

(3.) Velocity at any point of the way up = velocity at some point on the way down.

We add a few questions.

1. A stone thrown vertically up takes 6 sec. to rise and fall again to the ground: what height did it reach?

2. A body starts from rest, and moves with a uniform acceleration of 18 ft. per sec.: find the times taken to traverse the first and second ft. respectively.

3. From a balloon which is rising uniformly at the rate of 32 ft. per sec. a stone is let fall: if the height of the balloon from the ground be 4080 ft., find the time taken by the stone in falling.

4. Define the terms velocity, acceleration, and force.

5. What is an astronomical day?

6. State the laws of reflection of light: how may they be verified experimentally?

7. What do you mean by a penumbra?

QUERY COLUMN.

RULES.

1. Each correspondent is restricted to *one* question.

2. Each query must be accompanied by the name and address of the correspondent, and the *coupon* which appears on the back wrapper of the current number of the Journal.

3. CORRESPONDENTS MUST IN ALL CASES STATE THE SOURCE FROM WHICH THEIR QUERY HAS BEEN OBTAINED.

The Editor reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

Final B.Sc.—Newth's *Inorganic Chemistry*, 6s. 6d.; Perkin and Kipping's *Organic Chemistry*, 5s. (Chambers), or Bernthsen's *Organic Chemistry*, 6s. (Blackie), or *Outlines of Organic Chemistry*, 7s. 6d. (Churchill); Rideal's *Practical Organic Chemistry*, 2s. 6d. (Lewis); Clowes and Coleman's *Quantitative Analysis*, 7s. 6d. (Churchill); Tilden's *Chemical Philosophy*, 4s. 6d. (Longmans); Geikie's *Text-Book of Geology*, 28s. (Macmillan); Rutley's *Rocks*, 4s. 6d. For Palæontology, Nicholson's *Ancient Life History of the Earth*, 10s. 6d. (Blackwood); Gregory's *Elementary Physiography*. In addition Lapworth's edition of Page's *Geology*, 3s. 6d. (Blackwood), should be read. The ordinance map of your own district should also be well known. For Sound, Deschanel, Part IV. (Blackie), 4s. 6d.; Catchpool's *Sound* (U.C.C.), 3s. 6d. We should not advise you to bother about Honours Physiography.

Honours Chemistry, South Kensington.—Read Newth thoroughly and Part I. of Perkin and Kipping's *Organic Chemistry* (Chambers), 2s. 6d., and follow closely the Chemistry Notes appearing in our Science Section. It is necessary to know something of the history of chemistry, for which purpose Tilden's *Fifty Years of Modern Chemistry* (Cassell), 5s., will serve your purpose admirably.

Esk.—£360 is borrowed at 3 % simple interest, and it is to be repaid by 15 equal annual instalments of principal and interest combined. Find the value of these equal annual instalments.

The lender pays down the sum £360, and in return he is paid a certain sum £x at the end of the first, second, third . . . . fifteenth years.

The present value of a sum £x due in 1 year, reckoning simple interest, is y_1, where

$$y_1 + \frac{3}{100}y_1 = x,$$
$$\text{or } y_1 + \cdot 03y_1 = x,$$
$$\text{or } y_1(1\cdot 03) = x,$$
$$\therefore y_1 = \frac{x}{1\cdot 03}.$$

The present value of £x due in 2 years, in like manner, is y_2, where

$$y_2 + 2 \times \frac{3}{100}y_2 = x,$$
$$y_2(1\cdot 06) = x,$$
$$y_2 = \frac{x}{1\cdot 06}.$$

Proceeding in this manner, and remembering that £360 is the present value of all the instalments, we obtain

$$x\left(\frac{1}{1\cdot 03} + \frac{1}{1\cdot 06} + \frac{1}{1\cdot 09} \cdot \cdot \cdot \cdot + \frac{1}{1\cdot 45}\right) = 360.$$

After a little exercise in division, this gives

$$12\cdot 33x = 360.$$
$$\therefore x = 360 \div 12\cdot 33 = 29\cdot 2 = £29,\ 4s.$$

G.V.—Solve $\sqrt{(2x + a)} - \sqrt{(x + 2a)} = \frac{x}{\sqrt{a}} - \sqrt{a}$.

This becomes

$$\sqrt{(2x + a)} - \sqrt{(x + 2a)} = \frac{x - a}{\sqrt{a}}.$$

Multiply both sides by the complementary expression $\sqrt{(2x + a)} + \sqrt{(x + 2a)}$.

This gives

$$x - a = \frac{(x - a)\{\sqrt{(2x + a)} + \sqrt{(x + 2a)}\}}{\sqrt{a}},$$
$$\text{or } (x - a)\left\{1 - \frac{\sqrt{(2x + a)} + \sqrt{(x + 2a)}}{\sqrt{a}}\right\} = 0.$$
$$\therefore x - a = 0, \text{ or } 1 - \frac{\sqrt{(2x + a)} + \sqrt{(x + 2a)}}{\sqrt{a}} = 0.$$
$$\therefore x = a, \text{ or } \sqrt{(2x + a)} + \sqrt{(x + 2a)} = \sqrt{a}.$$

Solving the latter, we obtain, on squaring both sides,

$$3x + 3a + 2\sqrt{(2x^2 + 5ax + 2a^2)} = a,$$
$$2\sqrt{(2x^2 + 5ax + 2a^2)} = -(2a + 3x).$$

Again squaring—

$$8x^2 + 20ax + 8a^2 = 4a^2 + 12ax + 9x^2,$$
$$x^2 - 8ax = 4a^2,$$
$$x^2 - 8ax + (4a)^2 = 4a^2 + 16a^2 = 20a^2,$$
$$x - 4a = \pm 4a\sqrt{5},$$
$$x = 4a \pm 4a\sqrt{5}$$
$$= 4a(1 \pm \sqrt{5}).$$

Ans. $x = a$, $4a(1 + \sqrt{5})$ or $4a(1 - \sqrt{5})$.

Several replies and solutions are unavoidably held over this month.

Oxford Local Junior, *Bike*, and *Variable* may have solutions by post.

OUR SCIENCE SECTION

☛ **Subscribers requiring Explanations of Difficulties in any branch of Science, or Advice upon Courses of Study, can obtain all help required by communicating with the Editor, and accompanying their query with the Coupon cut from this Number.**

STAR STUDY
FOR SCHOLARSHIP STUDENTS.

IX.—AUGUST.

THE constellations will during the month of August be found grouped as follows:—

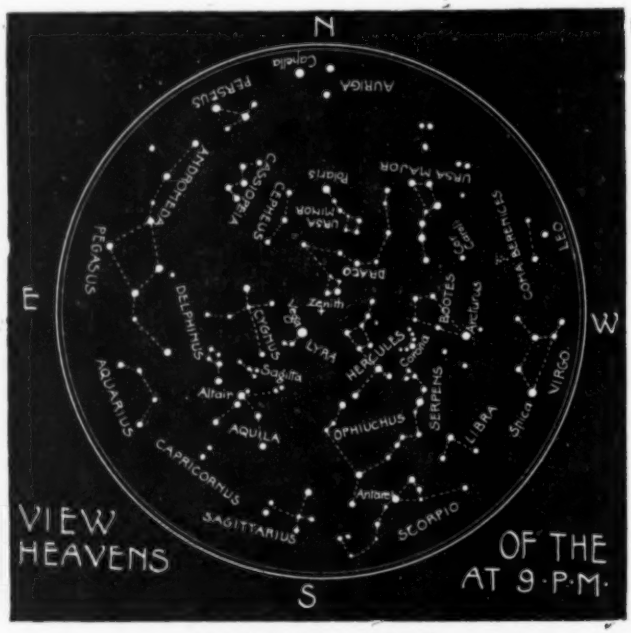
In the **Zenith** will be found Draco, Lyra, and Hercules. The most conspicuous object in this overhead portion of the heavens will be a Lyrae, the beautiful Vega, which is on the opposite side of the heavens to Capella, to which we shall presently refer.

The **North** is resplendent with Ursa Minor, Auriga with Capella on the horizon. Andromeda and Cassiopeia are in the north-east. It is worthy of note that Polaris constitutes a centre round which are grouped the Plough, Cassiopeia, Capella (a Aurigae), and Vega (a Lyrae). The student should verify this statement in observing Vega and Capella during this month of August.

Looking **East,** the student will see Cygnus, Aquila, Dolphin, the Great Square of Pegasus, Aquarius, and Pisces.

To the **South** lie Sagittarius, Scorpio, and Ophiucus.

The **West** is bright with Corona, Boötes, together with Ursa Major, which lies to the north-west.



STAR MAP NO. IX. (AUGUST).

Delphinus, or the Dolphin, is a faint cluster of stars lying to the east of Aquila, worthy of mention because Aratus, who lived two hundred and fifty years prior to the Christian era, wrote a poem in which he especially describes the Dolphin, whilst making no reference to other much more conspicuous asterisms.

The Planets.—**Venus** and **Mercury** are too near the sun to allow of them being visible before early morning, hence Venus is now a morning star situated in Cancer, rising about three and a quarter hours before the sun. She is at her greatest brilliancy on the 14th inst., and is near the moon on the 21st. Mercury is also a morning star. On the 19th he is at greatest western elongation. He is situated in Cancer, and the best part of the month for attempting to observe him is from the 10th to the 25th.

Jupiter is an evening star in Scorpio, setting just before 11 p.m., and near the moon on the 5th.

Mars is in Gemini, and rises just after midnight.

Saturn is visible from sunset to midnight. He is in the constellation Sagittarius, and in the middle of the month passes the meridian at about a quarter past eight.

The Milky Way, which we have already discussed, and which the student should again read up in Gregory's *Physiography* or *Astronomical Geography* (Thomas Nelson and Sons), is now in the best possible position for observation. It streams diagonally across the heavens from north-east to south-west, and passes right through the zenith. In the north-east it starts where Auriga is just rising, and passes on through Perseus and Cassiopeia to Cygnus, and then descends on the other side through Aquila, Serpens, Sagittarius, and Scorpio down to the south-western horizon. This description applies most accurately to mid-July, but the positions for the beginning of August will not be very greatly altered. Not until mid-December will the galaxy again be in the zenith, when it passes upward from the south-eastern horizon in Argo, between Orion and Gemini, to the zenith; and then descends, by way of Perseus and Cassiopeia, to the horizon. It will be a useful exercise for the student to draw the Milky Way as it appears at the beginning of August, marking and naming the principal constellations as they occur.

The Perseids.—August and November are the two months of the year during which observers expect to feast their eyes upon the more entrancing of celestial appearances—namely, a shower of falling stars or meteorites. From 9th August to 15th August such a fall may be expected; but the brilliance will be small, as will be seen from what follows. What a meteorite is like is well described by Dr. Johnstone Stoney. "The meteors themselves," according to this eminent authority, "are probably little pebbles, the larger about an ounce or perhaps two ounces in weight, and spaced in the densest part of the swarm at intervals of one or two miles asunder every way. The thickness of the stream is about one hundred thousand miles, which, however, is a mere nothing compared with its enormous length. The width is such that the earth, when it passes obliquely through the stream, is exposed to the downpour of meteors for about five hours."

Although there is much to learn yet as to the origin of meteorites, it is now certain that they are derived from those wonderfully tenuous bodies the comets, since meteor swarms have frequently been shown to have the same orbit as comets; moreover, an enormous increase in numbers follows upon the disappearance of a comet. In revolving round the sun, these swarms come sufficiently near the earth at certain periods in the earth's revolution for some of the meteorites to be attracted towards our planet, and that, too, with incredible speed. A little reflection will make it clear that a body rushing through the earth's atmosphere—even the uppermost layers of extreme rarity—at very great speed must engender very great heat as a consequence of its friction against the air. By the action of this heat the meteorites are converted into vapour, and the streak of light that marks the advent of the meteorite within our atmos-

where marks also the destruction of the meteorite itself. Professor Dewar has calculated that a body three feet in diameter, moving 18 miles per second at an altitude of 23 miles, where the pressure of the atmosphere is reduced to $\frac{1}{4}$th inch, as opposed to 29 inches at the level of the sea, would compress the air in its path five thousand six hundred times, the heat thus produced being equal to thousands of degrees Centigrade, and capable of converting the most refractory substances into vapour.

For a further study of meteorites, which the occurrence of the August shower makes appropriate, the student is referred to Gregory's *Physiography*. It may, however, be stated that the swarm under study—the tears of St. Lawrence, as they have been called, from their occurrence on the day of that saint, namely, the 10th of August—appear to radiate from the constellation Perseus (to speak more accurately, from γ Persei; hence the name Perseids), and that they follow exactly the same track as a bright comet that was discovered by Tuttle in 1862, from which the swarm is undoubtedly derived.

CHEMISTRY NOTES.

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.),
First Class Honoursman in Chemistry.

The Atomic Weight of Iron.—The atomic weight of iron usually employed—namely, Fe = 56—is a corrected value of Berzelius's result, and was obtained by the conversion of the metal into ferric oxide. Professor Richards of Harvard has undertaken the redetermination of this ratio. In the preliminary determination ferric oxide was reduced to metal, the oxide having been obtained from ferric hydrate prepared with great care from very pure iron ribbon and from ferric nitrate. The former method gave an atomic weight of 55·900 as the mean of two almost identical determinations, whilst an atomic weight of 55·883 was the mean of five determinations obtained by the employment of the second method of preparation. It is thus probable that the atomic weight of iron lies somewhere about 55·88; but Professor Richards is making further experiments with the view to greater accuracy and certainty.

Peroxide of Lithium.—The combustion of lithium in an atmosphere of oxygen gives trace—very slight, it is true—of this compound, due probably to the fact that the peroxide dissociates into oxygen and monoxide. M. de Forerand finds that by using the wet method of preparation, where peroxide of hydrogen is allowed to act on a solution of lithia, a peroxide is formed. Two separation experiments were tried, the crystals separating out in the two cases having the formulæ—

$$Li_2O_2,\ H_2O_2 + 3{\cdot}07H_2O, \text{ and } Li_2O_2,\ H_2O_2 + 2{\cdot}77H_2O.$$

Polysulphides of Lead and Copper.—When polysulphide of calcium is poured into a dilute solution of a lead or copper salt, a voluminous precipitate is produced, whose colour varies with the nature of the metal. M. Bodraux has isolated these two bodies, and has shown by their analysis that they have respectively the composition PbS_3 and Cu_2S_3. The lead compound is, at low temperature, a purplish red substance, which, above 10° C., rapidly decomposes into lead monosulphide and sulphur. The copper compound is brownish red in colour, and is stable at ordinary temperature; but after a few days it also decomposes into monosulphide and sulphur.

Some Aluminium Compounds.—M. Fonyes-Diacon describes in *Comptes Rendus* the synthesis of various binary compounds of aluminium. Thus he obtains aluminium sulphide by the action of sulphur vapour on aluminium filings, and by similar methods he prepares pure aluminium selenide, phosphide, and arsenide. He finds that antimony combines directly with aluminium, but with great difficulty. By the easy decomposition of the above bodies with water, large quantities of H_2S, H_2Se, PH_3, and NH_3 can be obtained, and by the same method, but in lesser quantity, SbH_3.

Ozone formed by the action of Fluorine on Water.—M. Henri Moissan has discovered a method of preparing ozone by means of fluorine, which is itself obtained much more cheaply by the copper voltameter, as already described in these columns. The fluorine is passed by a small platinum tube through a water jacket kept at a temperature of 0° C. It then passes into a Chancel flask with a round bottom, which is gradually filled, by displacement, with ozonised oxygen, the composition of which is determined by titration with a solution of iodide of potassium in presence of an excess of sulphuric acid to prevent the formation of iodate.

To transfer the solution of iodine into the flask without losing any iodine, a long-stemmed funnel is fixed to the central tube, and the liquid, to which sulphuric acid has been added, is poured in. The flask is then thoroughly cooled down by means of carbonic acid and acetine. The gas contracts, and on opening the top the liquid runs into the interior. This is repeated until the gas no longer colours the iodide. The end of the reaction is recognised by allowing the flask to take the temperature of the laboratory, and then letting a bubble of the gas pass through the top into the funnel, in which there remains a little iodide solution. This bubble ought not to produce any coloration. After shaking, the flask is uncorked, and the free iodine estimated by means of hyposulphite.

The proportion of ozone produced in the gas was by volume 14·39 per cent., which, however, does not represent the extent of concentration actually arrived at, since the displacement of the air in the flask by ozone requires a fairly long time, during which the concentrated ozone decomposes. M. Moissan thinks that this method of preparing ozone may ultimately be utilised commercially.

Hydrated Peroxides of Calcium.—Mixtures of solutions of hydrogen peroxide and lime show that this base, like baryta and strontia, forms precipitates of hydrated peroxide more soluble than those of the peroxides of strontium, but less soluble than the corresponding barium compounds. Between 10° C. and 16° C. baryta and strontia give precipitates containing eight or nine molecules of water, whilst the calcium precipitate contains only two molecules of water, and has a very different test of formation. The transformation of calcium dioxide into the hydrated state depends solely on the temperature, the critical temperature being somewhere about 15° to 20° C.

On the Weight of Hydrogen desiccated by Liquid Air.—Lord Rayleigh, F.R.S., has recently communicated a paper on the above subject to the Royal Society, which we give as printed in *Nature*:—"In recent experiments by myself and others upon the density of hydrogen, the gas has always been dried by phosphoric anhydride; and a doubt may remain whether, on the one hand, the removal of aqueous vapour is sufficiently complete, and, on the other, whether some new impurity may not be introduced. I thought that it would be interesting to weigh hydrogen dried in an entirely different manner, and this I have recently been able to effect by means of liquid air acting as a cooling agent, supplied by the kindness of Professor Dewar from the Royal Institution. The operations of filling and weighing were carried on in the country as hitherto. I ought perhaps to explain that the object was not so much to make a new determination of the highest possible accuracy, as to test whether any serious error could be involved in the use of phosphoric anhydride such as might explain the departure of the ratio of the densities of oxygen and hydrogen from that of 16 : 1. I may say at once that the result was negative.

"Each supply consisted of about six litres of liquid, contained in two large vacuum-jacketed vessels of Professor Dewar's design, and it sufficed for two fillings with hydrogen at an interval of two days. The intermediate day was devoted to a weighing of the globe empty. There were four fillings in all, but one proved to be abortive owing to a discrepancy in the weights, when the globe was empty, before and after the filling. The gas was exposed to the action of the liquid air during its passage in a slow stream of about half a litre per hour through a tube of thin glass.

"I have said that the result was negative. In point of fact the actual weights were $\frac{1}{10}$ to $\frac{3}{10}$ milligrams heavier than in the case of hydrogen dried by phosphoric anhydride. But I doubt whether the small excess has any significance. It seems improbable that it could have been due to residual vapour, and it is not perhaps outside the error of experiment, considering that the apparatus was not in the best condition."

Electrical Chemistry.—In the issue of *Nature* for June 7, Dr. F. Mollwo Perkin contributes an article in continuation of a previous article, to which reference was made in these pages, and to which we direct the attention of all students of chemistry. We give as a sample the use made of electricity in the manufacture of a bleaching mixture:—"According to the manner in which the electrolysis is conducted, a solution of potassium chloride may be converted into chlorine and caustic potash, potassium hypochlorite, or into potassium chlorate. If the electrolysis takes place at low temperatures, a solution of hypochlorite is obtained, which may, without further treatment, be used for bleaching purposes. The difference in price between this solution and a solution of bleaching powder is not great, but the greater cleanliness and purer bleaching action of potassium (sodium) hypochlorite make it, when electric power can be easily obtained, at least a powerful competitor with bleaching powder. When the electrolysis is conducted at temperatures from 60° and upwards, the bath being kept slightly alkaline by addition of potassium bicarbonate or lime, potassium chlorate is produced,

which, owing to its slight solubility in water, crystallises out, and, by washing, is readily freed from adhering chloride.

"If caustic potash and chlorine are required, some arrangements must be made to prevent the liberated chlorine from again reacting with the caustic potash formed at the same time. Formerly, and still to a small extent, this was arranged by means of a diaphragm which separated the anode from the kathode. Owing, however, to the difficulty of obtaining a *pervious, impervious* diaphragm—that is, one which allows the current to pass, but is impervious to the solution—it is now more general to electrolyse without a diaphragm. The method employed is one which was originally employed by Castner and Kellner, the kathode being a layer of mercury at the bottom of the bath. On the current being passed, the potassium liberated at the kathode dissolves in it, forming an amalgam which, as it is formed, is drawn off and run into pure water, the water being decomposed, by the assistance of an auxiliary current, with evolution of hydrogen and formation of caustic potash, which is obtained in the pure condition by evaporation. Carbonate of potash may be prepared by passing a stream of carbonic acid gas into the caustic liquor before evaporation. In commerce, naturally it is more general to electrolyse the cheaper sodium chloride, at any rate in this country. Strontium and barium chlorate are also prepared by the electrolysis of their chlorides."

NOTES ON ADVANCED AND HONOURS PHYSIOGRAPHY.

The Formation of Minerals in Granite.—Mr. C. E. Stromeyer maintains that not only temperature and rate of cooling but also pressure have combined to influence the mineral composition of granites. Where the solid rock resting on the molten mass is of low specific gravity and a bad conductor of heat, the depth at which granite rock would commence to solidify would not be great, and most probably the quartz would crystallise first, forming perhaps quartz porphyry; where the rock resting on the molten mass is heavy in consequence of the presence of much iron oxide, and acting as a good conductor of heat, the depth at which the granite would commence to solidify would be much greater, the pressure would be much greater, and most probably the quartz would remain fluid long after the felspars had crystallised, forming, say, felspar porphyry. Between these two states Mr. Stromeyer contends that every intermediate condition is conceivable.

Wind Force.—Amongst the highest velocities recorded in the British Isles is a severe gale in the Irish Sea in January 1899, in which a speed of 90 miles an hour was recorded in one gust: the maximum mean force at Fleetwood for one hour was 75 miles. The highest recorded velocity in a gust was recorded by Dines' anemometer at Rousdon, in South Devon, in March 1897—namely, a rate of 101 miles per hour. At Greenwich a pressure of 51½ lbs. on a square foot was recorded on January 18, 1881, which is equivalent to a velocity of about 130 miles per hour; but there is good reason for believing that in strong winds the records of these pressure plate anemometers are occasionally much too high.

Ancient Records of Meteor Showers.—The director of the Athens Observatory has unearthed some very interesting ancient records of meteor showers that fit in well with the showers that we are accustomed to expect at the present day. The patriarch Nicephore mentions a shower as lasting all night in the autumn of the year 752, which was probably a shower of Andromedes. Indeed, calculating backwards from the conspicuous falls of Biela's in 1852, 1872, and 1892, the twenty years' interval corresponding to three periods of the comet, it is evident that the year 752 would be a member of such a series. Seven years prior to this—that is, in 745—the appearance of a great comet was recorded by Theophanes and Cedrinos. It may be, however, that the showers of 1852 and later are not from the same swarm as the shower of 752, but products of the continued slow disintegration of the comet.

Another passage in Cedrinos describes a shower in 558, also occurring in the autumn, and apparently connected with a comet the appearance of which was recorded in 518, the interval being almost six times the periodic time of Biela's comet, so that here there would appear evidence of a second series of showers connected by similarity of period with Biela's comet, but occurring at different epochs from the first series mentioned. The modern showers of 1798 and 1838 would fall in this second group.

Theophanes in 763, and Domno Alberico in 1122, record falls of shooting stars in April which correspond with the modern showers of Lyrids.

It is impossible to connect with any known radiant a shower that Alberico records to have fallen in April 1094.

The next Total Eclipse of the Sun.—Before the reports of the 1900 total eclipse of the sun have been published, already attention is being directed to the next total eclipse of our luminary, which is timed to occur on May 17, 1901. The duration of totality and other important facts are given in the table that follows:—

Station.	Long.	Lat.	Duration.
Mauritius.....	57° 33·2′ E.	20° 6′ S.	3 m. 35 s.
Padang, Sumatra.	100° 20·5′	0° 58′	6 m. 14 s.
Pontianak, Borneo.....	109° 20′	0° 1′	5 m. 40 s.
Port Victoria, Amboyna.	128° 11′	3° 41′	4 m. 15 s.
Port Moresby, N. Guin. .	147° 9′	9° 28′	3 m. 19 s.

Shadow Bands.—A few seconds before and after totality in the late eclipse of the sun, the usual dark fringes or shadow bands were well observed, as was the case in previous eclipses. Señor Ventosa of the Madrid Observatory has been inquiring into the cause of these curious appearances, and has made the following communication concerning them:—

What the Shadow Bands are.—These alternating dark and bright fringes are parallel to each other, all moving in the same direction, but the velocity varies from time to time. Several reasons have been advanced to account for their appearance, chief of which are those regarding them as (*a*) diffraction fringes bordering the actual shadow of the moon on the earth's surface; (*b*) shadow phenomena produced in the body of our own atmosphere, and affected by the direction of the wind. The examination of the observed facts appears to support to some extent those holding the latter view, as, while the bands may well be seen in one place, they may be invisible in a neighbouring locality; their form, generally rectilinear or slightly undulating, is also variable; while their breadth has been variously estimated from 1 to 50 centimetres, although this will, of course, partly depend on the inclination of the surface on which they are observed. Sometimes they move with about the speed of a man walking, at others with the speed of an express train, the velocity being always less, however, than that of the shadow itself. During the late eclipse, the shadow moved through 800 kilometres in 12 minutes.

REPLIES TO SCIENCE QUERIES.

Ploughed.—1. The best books on the differential and integral calculus are probably *Differential Calculus* (Boston: Ginn and Co.), and *Integral Calculus* (second edition, same publishers), both by W. E. Byerly. Edward's *Differential and Integral Calculus* and Professor Perry's *Calculus for Engineers* can also be recommended.

2. The best advanced work on electricity is Professor J. J. Thomson's *Elements of Electricity and Magnetism*. Poyser's *Electricity* and Professor Sylvanus P. Thompson's well-known work are of a more elementary character.

3. The best periodicals on physics and mathematics are as follows:—*The Electrician* (3d. weekly), published at Salisbury Court, Fleet Street; *Science Abstracts* (2s. monthly), E. and F. Spon, 125 Strand, W.C.; *Philosophical Magazine* (Taylor and Francis); *Annalen der Physik und Chemie* and *Zeitschrift für Physikalishe Chemie* (German periodicals).

Problem.—If a light body of specific gravity s be weighed with weights of specific gravity σ, when the specific gravity of the air is ρ and the barometer 30″, find what part of its previous weight the body weighs when the barometer falls 1″.

(Victoria Univ. Inter. B.Sc., 1900.)

Let W be the true weight (*in vacuo*) of the body to be weighed; then its volume will be $\frac{W}{s}$, and the weight of the air displaced, when the density of the latter is ρ, will be $\frac{W}{s}\rho$. Similarly, the weight of the air displaced by the weights (w grams, say) which are used in weighing the

FOR QUEEN'S SCHOLARSHIP CANDIDATES, DECEMBER 1900.

NOW READY. ***PRICE 3s. 6d.***

A VALUABLE NEW WORK ON

Elementary Science.

SPECIALLY PREPARED TO MEET THE REQUIREMENTS OF

SCHOLARSHIP AND P.T. SYLLABUS IN ELEMENTARY SCIENCE.

Each Section is exhaustively treated, and is followed by a Summary and a series of carefully graduated Questions.

Being the only work in the market specially prepared on the lines of this Syllabus, it will be found indispensable to all P.T. and Scholarship Candidates.

By J. H. NANCARROW,

Late Head-master of Kingston Public School of Science, and Lecturer in Physiography at the Richmond School of Science; Author of "Elementary Physiography," and "Advanced Physiography," etc., etc.

Mr. W. DONE, B.A., Superintendent of the P.T. Department, Brighton School Board, writes:—

"I think it answers its purpose admirably."

Mr. MORTON MATTHEWS, Head Teacher P.T. Classes, Halstead, Essex, writes:—

"I read through Chapters vii., viii., and ix. this morning, and was delighted. I have already recommended it to the Pupil Teachers as being just the thing."

Mr. J. A. COOPER, Technical Schools, Widnes, says:—

"It seems to me excellent in every respect. It is very practical, evidently written by a man thoroughly conversant with his subject. It is tastefully printed and bound, and a creditable publication to author and publisher."

Mr. S. B. NAYLOR, Head Teacher P.T. Centre, Horwich, writes:—

"No one, I am sure, need fear the exam. after working conscientiously through your book. I shall strongly recommend it to my P.T.'s."

Miss MAGUIRE, P.T. Centre, Charlotte Street, Glasgow, writes:—

"I am very much pleased with the matter and general arrangement of this excellent book, and shall adopt it as a class-book at this Centre."

Mr. J. A. EMERY, F.R. Hist. S., Head-master Higher-Grade Board Schools, Cinderford, Glos., writes:—

"I am highly pleased with the 'Elementary Science.' Each section of the work is most admirably and exhaustively treated.

"I must confess I am charmed with the book. A pupil teacher may use it throughout his apprenticeship, and thoroughly cover the whole syllabus for each year's work. The diagrams, too, are most clear. May add that in making up my requisition list to-day I placed your new work for adoption here."

Mr. T. A. TAYLOR, St. Andrew's Church Schools, Netherton, writes:—

"I think it a capital book for Scholarship Students, and shall not hesitate to recommend it."

Mr. A. J. MOCKRIDGE, B.A., Principal Oxford Pupil Teachers' Centre, late Senior Master Culham Training College, writes:—

"Its arrangement is admirable, the diagrams are very clear and almost self-explanatory, and the truly educational method adopted in the descriptions of the experiments is deserving of high praise. The excellent summaries and well-graded questions at the end of each chapter are valuable features of the book. I shall have very great pleasure in commending it to the notice of our students."

To be obtained through all Booksellers, or post free at published prices from

RALPH, HOLLAND, & CO.,

EDUCATIONAL BOOKSELLERS & PUBLISHERS,

69 TEMPLE CHAMBERS, LONDON, E.C.

Just Ready. Handsomely bound in extra cloth. Price 12s.

VOLUME XX

OF THE

Practical Teacher

TOGETHER WITH

All the Beautifully Printed

COLOURED OBJECT-LESSON SUPPLEMENTS

ISSUED WITH THE NUMBERS OF THE VOLUME.

As only a very limited number of Copies are on sale, early application should be made to Booksellers.

The Practical Teacher Office,

35 and 36 Paternoster Row, LONDON, E.C.

Self-Preparation in the New Freehand.

PHOTOGRAPHIC REPRESENTATIONS OF CASTS.

WITH PENCIL DRAWINGS AND IMPORTANT NOTES TO STUDENTS.

By B. C. HASTWELL,

Art Master, Pupil Teachers' Schools, London School Board.

In One Packet, containing 12 Sheets, price 2s. 6d.

Each Sheet contains—

(*a*) **Photographic Representation of Cast.**
(*b*) **Key Sketch in Outline.**
(*c*) **Finished Sketch in Outline.**

With Practical HINTS, NOTES, etc., to Students.

**** *Prospectus, with Specimen of Sheet, post free on application.*

T. NELSON AND SONS,

35 and 36 Paternoster Row, London, E.C.;
Parkside, Edinburgh; & New York.

body, when the density of the air is ρ, will be equal to $\frac{w}{\sigma}\rho$. Hence,

$$W - \frac{W}{s}\rho = w - \frac{w}{\sigma}\rho \quad \ldots \ldots \ldots \quad (1)$$

If, when the density of the air is ρ', it is found necessary to use weights amounting to w' grams, then we shall have—

$$W - \frac{W}{s}\rho' = w' - \frac{w'\rho'}{\sigma} \quad \ldots \ldots \ldots \quad (2)$$

Dividing (2) by (1), we get—

$$\frac{w'}{w} \cdot \frac{1 - \frac{\rho'}{\sigma}}{1 - \frac{\rho}{\sigma}} = \frac{1 - \frac{\rho'}{s}}{1 - \frac{\rho}{s}}.$$

$$\therefore \frac{w'}{w} = \frac{\sigma - \rho}{\sigma - \rho'} \cdot \frac{s - \rho'}{s - \rho} \quad \ldots \ldots \ldots \quad (3)$$

If ρ = density of air when the barometer reads 30″,
ρ' = " " " " " 29″.

Then $\frac{\rho'}{\rho} = \frac{29}{30}$.

Hence, substituting in (3), we get—

$$\frac{w'}{w} = \frac{\sigma - \rho}{\sigma - \frac{29}{30}\rho} \cdot \frac{s - \frac{29}{30}\rho}{s - \rho}$$

$$= \frac{\sigma - \rho}{\sigma - \rho + \frac{\rho}{30}} \cdot \frac{s - \rho + \frac{\rho}{30}}{s - \rho}.$$

Simplifying, we get—

$$\frac{w'}{w} = \frac{1}{1 + \frac{\rho}{30(\sigma - \rho)}} \cdot \frac{1 + \frac{\rho}{30(s - \rho)}}{1}.$$

Expanding by means of the binomial theorem, we get—

$$\frac{w'}{w} = \left\{1 + \frac{\rho}{30(s - \rho)}\right\}\left\{1 - \frac{\rho}{30(\sigma - \rho)} + \ldots\right\}$$

$$= 1 + \frac{\rho}{30}\left(\frac{1}{s - \rho} - \frac{1}{\sigma - \rho}\right) + \ldots .$$

(neglecting terms involving powers of $\frac{\rho}{\sigma - \rho}$, etc., higher than the first).

Since ρ will probably be very small in comparison with s and σ, this may finally be written—

$$\frac{w'}{w} = 1 + \frac{\rho}{30}\left(\frac{1}{s} - \frac{1}{\sigma}\right),$$

which is the result required.

THE SCIENCE AND ART DIRECTORY FOR 1900.

Commendable Dispatch.—The Board of Education is to be congratulated upon the early issue of the rules and regulations that are to guide the army of science and art teachers from August 1, 1900, to July 31, 1901. By the courtesy of the Board we were enabled to give in our issue for June a list of the more important changes that are to come into force from August 1. It will therefore only be necessary to give a few particulars by way of supplement to this list.

A Sinister Addition.—Clause VI., which formerly contented itself with demanding local support of science classes in fees, subscriptions, and rates, now enacts that the only rate aid shall be such as is "*levied under the Technical Instruction Act.*" This is a sinister anticipation of the verdict of the Court of Queen's Bench—expected in November next—as to the right of School Boards to spend rates in support of science and art classes, and is a death-blow to School Board expenditure on such classes. No wonder School Boards are petitioning against this cool usurpation of judicial functions by the Board of Education in respect to a case still *sub judice*.

Elementary Examinations, 1s. 6d. per Head.—Not only will the grant for the elementary stage of a subject depend entirely upon the inspector's report as to the efficiency of the teaching, but also pupils are not to be allowed to be examined by the inspectors of the Board unless an examination fee of 1s. 6d. (2s. 6d. for practical subjects) per head has previously been paid; so that examinations in the elementary stages will be conspicuous by their rarity. A certificate will be given to all students who attend an elementary course, but it will refer to the attendances made by the pupil, and not to his success at an examination as heretofore.

Schools of Science.—The most important alteration here is in the form of an addendum to the effect that a special advanced course for rural districts has been arranged. We do not anticipate that there will be any rush to found and form schools of science in these by-paths of Arcadia, especially now that School Boards are to be shut out from participation in the good work; but here are the courses for such as feel disposed to build up a school of science in their neighbourhood:—

Elementary Course for Men in Rural Districts.

1. Mathematics.
2. Chemistry (with practical work).
3. Physiography or Elementary Physics.
4. Biology or Elementary Botany (practical work may be in the field or garden).
5. Drawing, Practical Geometry, or Practical Mathematics (manual instruction in its application to workshop and garden must form part of the course).

ADVANCED COURSE.

1. Principles of Agriculture (elementary or advanced, with practical work).
2. Chemistry applied to Agriculture (with practical work).
3. Botany (with practical work).
4. Biology (with practical work).
5. Physiology (human and animal).
6. Geology (with field work).
7. Zoology.
8. Mechanics (as applied to agricultural processes).
9. Practical Mathematics.
10. Land Surveying.

Elementary Course for Women in Rural Districts.

1. Elementary Mathematics.
2. Physiography or Chemistry or Physics.
3. Biology.
4. Botany or Hygiene (obligatory in the second year only).
5. Freehand Drawing or Elementary Practical Geometry.

ADVANCED COURSE.

1. Mathematics.
2. Botany or Biology.
3. Hygiene or Physiology.
4. Physiography or Physics or Chemistry.
5. Principles of Agriculture (poultry-keeping, dairying, bee-keeping, etc.).

Optional Subjects.

One of any of the above subjects not taken, or either Geology or Zoology, or an approved art subject.

The advanced stage of at least one subject must be taken.

In addition to the above, the same amount of time must be devoted to literary subjects as in the courses applicable to urban centres; so that if *multum* is not the rule, nobody can deny that *multa* is to be exacted. The course is anything but an ideal one.

New Syllabuses.—Of these it may be said that they are laid down on very rational lines. The work to be done in Science Subject I. is now specifically laid out, so that one now knows exactly what is required by the Board. The advanced stage now added to Practical Mathematics covers such ground as will make it possible for industrial and other non-mathematical students to understand the mathematical treatment of such science subjects as they may take up. The alterations in Mineralogy are very slight. In the elementary stage of Hygiene—Section I., which is to be introductory to Section II., is not yet settled. Students must apply later on to the Board of Education, South Kensington, when the syllabus, as completed by the addition of this section, will be forwarded free of charge. We may add that the alterations all show a laudable desire to make the work done more and more productive of benefit to the student; and it is pleasingly evident that the bad days of cast-iron regulations are now a thing of the past so far as South Kensington is concerned, whereat we rejoice greatly.

CAMBRIDGE UNIVERSITY PRESS.

THE CERTIFICATE EXAMINATIONS, 1901.

The following Works published by the Cambridge University Press will be found suitable for Students preparing for these Examinations:—

IN ENGLISH.

***MACAULAY.—Essay on Milton.** With special references to Dr. Johnson's "Life of Milton." Edited by J. H. FLATHER. 1s. 6d.

MILTON.—Paradise Lost, 1, 2. Edited by A. W. VERITY. 2s.

THE ELEMENTS OF ENGLISH GRAMMAR. By A. S. WEST. 2s. 6d.

Prefatory Note to the Enlarged Edition.—Some hundreds of additional Questions and Examples are given in the present edition, and in a few places the wording of the text has been altered. The numbers of the paragraphs remain the same.

School World.—"The larger work shows a master-hand. It is adapted to the higher forms, and its historical survey contains just what is wanted for examination purposes."

IN FRENCH.

The following Works will be found specially adapted for Training College use:—

ABOUT.—Le Roi des Montagnes. Edited by A. R. ROPES. 2s.

MALOT.—Remi et ses Amis. Edited by M. DE G. VERRALL. 2s.

MOLIÈRE.—Les Précieuses Ridicules. Edited by E. G. W. BRAUNHOLTZ. 1s.

And other Editions in the Pitt Press Series.

IN MATHEMATICS.

EUCLID. Edited by H. M. TAYLOR.

Books I. and II., 1s. 6d. — Books III. and IV., 1s. 6d.
Books I. to IV., 3s. — Books V. and VI., 1s. 6d.
Books I. to VI., 4s.

ELEMENTARY ALGEBRA. By W. W. ROUSE BALL. 4s. 6d.

ARITHMETIC FOR SCHOOLS. By C. SMITH. 3s. 6d.
(With or without Answers.)
Or in Two separate Parts, 2s. each.

***GEOMETRICAL DRAWING.** By W. H. BLYTHE.
Part I.—Plane and Elementary Solid. 2s. 6d.
Part II.—Solid or Descriptive Geometry. 2s.

IN EDUCATIONAL THEORY.

***ETHICS: THE MAKING OF CHARACTER.** By Professor J. MACCUNN. 2s. 6d.

Literature.—"An acute and thoughtful book."
Bookman.—"A sensible, scholarly treatment of an important subject."
Practical Teacher.—"It is a book to read and re-read, and will amply repay the closest study."

***EDUCATION OF THE YOUNG FROM THE "REPUBLIC" OF PLATO.** By B. BOSANQUET. 2s. 6d.

Literature.—"A scholarly translation, with notes and an introduction, sketching well and concisely the history of Greek education."

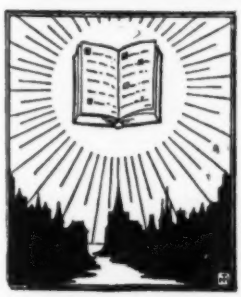
LOCKE'S THOUGHTS ON EDUCATION. By R. H. QUICK. 3s. 6d.

LECTURES ON TEACHING. By Sir JOSHUA FITCH. 5s.

**Books marked thus are included in the CAMBRIDGE SERIES FOR SCHOOLS AND TRAINING COLLEGES. Edited by W. H. Woodward, Principal of University Day Training College, Liverpool.*

Complete Lists on application.

London: C. J. CLAY AND SONS, Cambridge University Press Warehouse, Ave Maria Lane.



Moffatt's English School Classics.

NEW SERIES.

MOFFATT & PAIGE are issuing at a low price a new series of some of the most important works in English Literature, with Introduction and Notes intended for the use of Classes in Schools, Pupil Teachers, and Students generally.

These books are edited by THOMAS PAGE, whose editions of Shakespeare's Plays are so well known.

The following are now ready:—

GOLDSMITH'S The Traveller. Price **3d.**

GRAY'S SELECT POEMS—

(1) **Elegy in a Country Churchyard.**
(2) **The Bard.**
(3) **The Eton College Ode.**
(4) **The Progress of Poetry.**

} In one Book, **4d.**

MACAULAY'S Essay on Milton.

Specimens gratis to Principals.

MOFFATT & PAIGE, Ltd.,
28 Warwick Lane, Paternoster Row, LONDON, E.C.

DAY TRAINING COLLEGE

White St., Finsbury St., and Ropemaker St.,
Moorfields, London, E.C.

Approved by the Education Department, and recommended by H.M. Inspectors

Principal: PROFESSOR CUSACK.

SESSION 1900–1901.

The following Classes will commence early in September:—

L.L.A. CLASSES
MATRICULATION
TONIC SOL-FA CLASSES
KINDERGARTEN
SWEDISH DRILL
SCIENCE & DRAWING

Prospectuses now ready, and Post Free on application to

Professor CUSACK.

OUR COMPETITION PAGE

OUR FRENCH PRIZE COMPETITION.

Prize Editor—W. T. THOMPSON, B.A. (LOND.), *French and German Honours.*

Important to Scholarship, Certificate, and London Matriculation Students.

WE should like to specially direct the attention of our readers to the fact that the Board of Education, in the Syllabuses for the Scholarship and Certificate Examinations 1901, requires "no set books" for French and German. Students preparing for these examinations, as well as students for London Matriculation, could not do better than attempt month by month the pieces set for translation here. They are from the best authors, and of varied character. A competitor who does not gain a prize can derive considerable benefit from the exercise. A study of the successful competitor's translation, and of our remarks, will help him to see where he might have done better. If desired, his paper can be returned (fully corrected) by enclosing six stamps.—ED.

RULES.

1. All translations should be **posted not later than August 8,** and addressed:—*Prize Editor*, Office of THE PRACTICAL TEACHER, 33 Paternoster Row, London, E.C.
2. Competitors should cut out and send the Coupon which appears on the Back Wrapper page of the current number.
3. Competitors should adopt a pseudonym, and send name and address written on a separate piece of paper.
4. No competitor may take the prize offered more than once in three months.

FRENCH PRIZE COMPETITION.

A Prize of One Guinea will be given for the best translation into English of the following extract:—

Il y a dans le Coran une légende qui nous a toujours beaucoup frappé. Les démons errent autour du ciel et essayent de s'y faufiler par ruse. Ils guettent, ils s'insinuent, ils espionnent. Celui-ci regarde par un trou de serrure, celui-là colle son oreille à une fente de porte, cet autre appuie sa tête contre un volet clos derrière lequel il entend la musique des voix angéliques conversant entre elles. Mais les fentes et les trous de serrure ne leur laissent apercevoir que peu de chose des splendeurs célestes, et les portes et les volets les séparent trop de la cour divine pour qu'ils puissent entendre des conversations suivies. Ils attrapent donc des mots isolés, des phrases sans commencement ni fin, et, malgré tous leurs efforts, ils ne peuvent attraper rien de plus. Ils s'en retournent cependant avec cette provision de fragments, et, en esprits subtils qu'ils sont, sèment ces bouts de phrases parmi les hommes, certains de l'action funeste qu'ils ne pourront manquer d'avoir, séparés comme ils le sont de toute liaison avec les autres parties du discours auxquels ils se rapportent. La prévision des démons se réalise: ces mots sont acceptés avec empressement par les hommes, qui leur reconnaissent quelque chose de surnaturel; mais comme ils sont toujours forcément mal interprétés, ils ont des conséquences véritablement démoniaques, quoiqu'ils soient d'origine angélique. Cette légende est mieux qu'un symbole, c'est l'histoire vraie, authentique, de l'origine et des destinées des superstitions dans l'histoire de l'humanité.

MONTÉGUT.

RESULT OF THE JULY COMPETITION.

French.

The prize is awarded to "B.B.D.V.," the pseudonym of Miss R. F. Forbes, Eaton House School, Aldeburgh, Suffolk.

First Class.—Immerito, Nomis, Rhea, Bucephalus, W. 103, Huddersfield, Kari, Monad, Marzavan, J. Mackay, Rustica, L'espérance, A plain woman, Allez, Myosotis, Tibi, The Minch, Chemineau, Agaznog, Violette, Bernardine, Ignatius, Racine, Molly Seamore, Percy, Smollett, G.B.N., Yllop, Verbum sat sapienti, Flora, Hope, Penweeth, Clansman, Moloch, Uriconium, Dies, Shakspere, Fitzthomas, Staley, Sipa, Zoroaster, M.E.R., Dum spiro spero, Merle, J.F.Q., Ghislaine, Nailil, W.B.T., C.E.M., Maidstone, Un simple soldat, Esther, Tippet, Rutherford, Georgius, Ajax, Frosterley, Borealis, Antoine, Irénée, Dunelm, Cygnet, Des Roches, Jesmond, Caen, Jessica, Maida Vale, Marie I., Duffer, A.J.T., Bulldog, Consuetudo, Nota Bene, Sperantia, Louisiana; Wieder, Stretton, Diane, May, Delta, Oedipe, E.S., G.B.C., Vigilabo, Cleg, Venus, Cymric, Beethoven, Kettering, Amiens.

Second Class.—Prestione, Helen of Troy, Automobile, Bristol, Kythé, Cunctator, Leamington, Odd Rode, Nita, Merlin, Concours, Alexis, Elshender, Dier, Nemo, Beta, Smoke, J.G., Marie, July Twins, Uranie, Gloria, Shamus, Elise, Spero, Emarley, Nip, Map, Edythe, Scallywag, Annie, Myrtle, P.P.T.C., C.L.B., Anwyl Garfad, Peakite, Falstaff, Rue de Milan, Moy, Old Islingtonian, Viot, Llanroe, N.C.M., Imprimatur, Jeanne d'Arc, E.S.W., Hamlet, Amateur, Bella, Atmore, A.W.L., Anastasia, Florence, Triangle, Bosco, Acer, Corrie, Hamlet, V.K., Marguerite, Eugene, Peggotty.

Third Class.—Débutante, Never venture never win, Catws, Amolpid, Navy Blue, Morganwg, Shanghai.

Disqualified: Rule 2, San Toy, Buz.

Received 12th, too late for classication, Thor.

Report.

The most general cause of failure has again been due to lack of comprehension of the subject-matter of the extract. *Rien ne vaut une formule* has been taken by some competitors as if it were, *Une formule ne vaut rien*, "a formula is valueless." *Dé ranger Voltaire* has been humorously translated by one candidate, "to reform Voltaire." The misconception is obvious. *Prétendu* means, of course, "claimed," "alleged," "argued," "maintained," etc., but not "pretended." *Leibnitz ne nie pas le mal, comme les stoïciens, en niant la douleur* is somewhat vague, but any one who has an acquaintance with the Stoic system of philosophy knows that *en niant la douleur* can only refer to the Stoics. A competitor asks who is the Buckland referred to. We have not read the work in which Buckland enunciates the theories here criticised, but we have little doubt that it is Dean Buckland, the author of the Bridgewater Treatise.

French Prize Translation.

Everybody knows the optimist formula which Voltaire, even more than Leibnitz, has made common property: "All is for the best in this best of all possible worlds." Now this formula, as often happens, is taken in too arbitrary a sense. Nothing is so valuable as a formula for summing up a doctrine, for impressing it on the mind, and spreading it among the crowd. But if it be allowed a separate existence, apart from the philosophic system of which it is the expression, it will almost certainly be misunderstood. Those who have not read Leibnitz—and among them we should be inclined to place Voltaire—jump to the conclusion that the great metaphysician wished to maintain that evil was entirely banished from the world. Nothing of the kind. Leibnitz does not ignore evil, as do the Stoics, by ignoring pain; he does not aim, like Buckland, at turning evil into good by explaining it away. His theory is not meant to apply to the individual, nor even to the species, but to the creation generally and the entire duration of the universe. To created beings regarded as a whole, and in reference to the whole period of their existence, he attributes perfection, and that not absolute, but relative. This reservation once made, *Candide*, that admirable romance, while losing none of its originality and charm, ceases to be an argument.

B.B.D.V.

. . The Practical Teacher . .

Third Annual Amateur

PHOTOGRAPHIC COMPETITION

FOR THE HOLIDAYS.

FIRST PRIZE:—THREE GUINEAS.

SECOND PRIZE:—ONE GUINEA.

Two other Prizes, each of Half a Guinea, may be awarded at the discretion of the Judges.

☞ Owing to the success of previous Competitions, we again specially appeal to those of our readers who rely on their Camera for providing amusement during their Holidays, and material which may enliven a dull lesson when work is resumed, to enter this Competition, and to kindly aid us by making this Announcement as widely known as possible among their professional friends.

CONDITIONS.

Competitors must send in one mounted copy of each of three different subjects. The subjects may be varied as much as desired—Landscape, Seashore, River, Town, Country, Street, Figure, Animal Life, etc., etc

Short explanatory notes of subject, together with full name and address of competitor, must be written on the back of each photograph.

The prints submitted may be of any size and by any process, but must be done wholly by the competitor, and without professional aid in the production of either negative or copy.

Photographs must be sent to the Office of "The Practical Teacher" by September 4, and marked "Photographic Competition." The result will be announced in the issue for the following month.

☞ **All Competitors will be required to send the Coupons of both the JULY AND AUGUST NUMBERS of "The Practical Teacher."**

THE EDITOR'S TABLE

G. W. BACON AND CO.'S EXCELSIOR DRAWING PUBLICATIONS.

(By F. Steeley and B. H. Trotman.)

New Drawing Charts—Soft Grey Line Series—Coloured. Messrs. Bacon and Co. have now issued a coloured set of these well-known excellent series of drawings. Without doubt they are the best set at present on the market, being beautifully-drawn, artistic examples of most interesting subjects. The colour, of course, further enhances their utility, and enables the scholars to better appreciate the space values. Many excellent suggestions for design are given on every sheet.

"Excelsior" Drawing Books. These contain the same drawings and designs as are given on the large charts, and thus permit the teacher to follow out an ideal plan—namely, to have a large copy for the purpose of general demonstration, and a small example for each scholar, so that the details can be well seen and drawn.

Uniform with these is the **Common Object Series.** They consist of drawings of the familiar things of everyday life with which children are surrounded, and which they delight to draw. Such examples are most useful in sustaining interest, and may be particularly suggestive as exercises for memory drawing.

Exercises in Squared-Paper Work. These are as excellent in every way as the drawing charts, both as regards the exercises and the way in which they are produced. We are glad to find that such recognised authorities as Messrs. Steeley and Trotman feel that some help such as is provided by the squared paper may be legitimately given to children in their early efforts in pattern work or design. The squares are large—one inch—so that the danger of cramping is done away with. Those teachers who have not yet tried this simple pattern work should do so; it is most interesting and helpful to the pupils.

A drawing book similarly ruled may also be had in which the scholars may copy the designs or invent similar ones.

A school equipped with these publications, and following them intelligently, could not fail to do excellent work from every point of view. We can heartily commend them to every teacher.

GEORGE BELL AND SONS.

C. Julii Caesaris De Bello Gallico, Liber Quintus. Edited by A. Reynolds, M.A. This is a useful and interesting edition for lower forms of the Fifth Book of the Gallic War. The larger editions of Long, Colbeck, Bond, Allcroft, and Peskett have been consulted, and special praise is given to Mr. T. Rice Holmes's *Cæsar's Conquest of Gaul*. There are good maps of Gallia in the time of Cæsar, and Cæsar's expedition to Britain, and a rough map of Cæsar's Britain. The introduction comprises a good, though short, life of Cæsar, an account of Gaul in the time of Cæsar, and of Britain and its inhabitants. Mr. A. C. Liddell of Nottingham School gives a good description of the Roman army. The illustrations are very clear and well chosen. For grammar, besides the notes there is an appendix on idioms and grammatical constructions, and a number of short prose exercises have been adapted to the text. An index of proper names and a complete vocabulary render the aid of a lexicon only occasionally necessary.

Selections from Vergil's Æneid, Books VII.-XII. Edited by W. G. Coast, B.A. An attempt has been made by Mr. Coast to provide beginners with easy typical passages from Vergil which shall form a fairly continuous narration of the last six books of the *Æneid*. The text followed is that of the Oxford Edition, and the notes are partly based on Conington, Sidgwick, and Papillon and Haigh. The illustrations are good; and an introduction gives some account of Vergil's life and works, the story of the *Æneid*, the *Æneid* as a poem, the metre and translations of Vergil. A grammatical appendix, a complete vocabulary, and an index of proper names complete the volume. This little book forms an easy introduction to the study of Vergil.

P. Ovidi Nasonis Tristium, Liber Tertius. Edited by H. R. Woolrych, M.A. The text used in this book is mainly that of Owen. His school edition of the Third Book of the *Tristia* has been laid under contribution in the notes, which are very fairly full and clear. There are two good illustrations of the Roman Forum among the illustrations. The introduction briefly discusses the life and character of Ovid, together with the characteristics of his genius. Some account is also given of the *Tristia* and the other works of Ovid. The vocabulary is due to Mr. C. E. Laurence. There is a grammatical index and an index of proper names.

A. AND C. BLACK.

The Talisman, with Introduction and Notes. By W. Melven, M.A. **Quentin Durward, with Introduction and Notes.** By H. W. Ord, B.A. Scott's novels seem to be gaining in popularity as school readers, and an edition such as the books before us will tend to increase this. In each case there is a good introduction, and a sufficiency of notes on various points in the text. It might, perhaps, have been well to include a brief life of the author; there are as many lessons to be learned from a short biography of the genial, talented, and heroic poet and novelist as from any of his works.

Marmion. By W. M. Mackenzie, M.A. **The Lay of the Last Minstrel.** By W. M. Mackenzie, M.A. **The Lady of the Lake.** By R. G. M'Kinlay, B.A. This is a capital edition of the best known of Scott's poems. The introductions contain all that is necessary to an intelligent appreciation of the text, which is further elucidated by adequate notes and maps. Any one of the books would be a very useful and interesting extra reader for an upper class.

WILLIAM BLACKWOOD AND SONS.

Cicero: In Catilinam, I.-IV. Edited by H. W. Auden, M.A. This is a very good edition of the Orations against Catilina. The introduction has notes on Cn. Pompeius, C. J. Cæsar, Crassus, Cicero, and Catilina, the decline of the Republic, with references to authorities, an outline of the life of Cicero, and an estimate of him as a politician, orator, and writer. There are sections on the Catilinarian conspiracy and its political aspect, the rhetorical form of the Catilinarian speeches, manuscripts, and chronology. Six hints are given for translating. Cicero's style is considered in an appendix, together with the rhetorical figures, connecting particles and terms used *in argumentatio* in Ciceronian Latin. For higher forms, a few exercises are given from English orators who afford a close parallel to Cicero's style in the Catilinarian speeches. For lower forms, the writing of logical summaries in sound but plain Latin is advised. The notes are mostly hints for translation. There is an index of proper names. The book is clearly printed and well bound, and the illustrations are good.

Simplex Civil Service Copy Book. Our readers would do well to write for a specimen of this book, and of the blank exercise books ruled on the same principle. They are worth careful attention.

English Classics.—1. **Goldsmith: Select Poems.** By J. H. Lobban.

2. **Milton: Paradise Lost, I.-IV.** By J. Logie Robertson.
3. **Macaulay: Life of Johnson.** By D. Nichol Smith.
4. **Cowper: Task, and Minor Poems.** By Elizabeth Lee.

We have much pleasure in calling the attention of readers to this excellent series of English classics. Each volume contains a life of the author, with a critical estimate of his works and position in literature, a most useful chronological table, and the text, followed by copious notes on all points of difficulty or interest. Every care has been taken to elucidate the text, and to add information likely to increase the interest aroused by its perusal. The books are handsomely bound and well printed.

W. AND R. CHAMBERS.

Twentieth Century Readers: First and Second Primers. Reading is made a pleasure to infants by such books as these.

BOARD OF EDUCATION, WHITEHALL.

Scholarship Examination, 1901,

AND

Certificate Examination, 1900–1901.

The Board of Education, in the Syllabuses for SCHOLARSHIP and CERTIFICATE EXAMINATIONS just issued for 1901, state that

"NO SET BOOKS IN FRENCH"

will be prescribed. Students preparing for these Examinations, as well as for London Matriculation, cannot do better than carefully study the volumes announced on our Back Wrapper page.

CODE BOOK-KEEPING, etc.

SARLL'S BOOK-KEEPING FOR NEW CODE. Stage I. Introductory; II. Practical; III. Theory or Journalising. Each 48 pp. Price 4d. Outline Keys. MS. Books, 2d. each. *Schoolmaster* says:—"They are the *best and cheapest* manuals of the kind in the market."

SARLL'S PRACTICAL BOOK-KEEPING. Fourteenth and *greatly* improved Edition. *Teachers' Aid* says:—"There is no *cheaper* and *safer* guide." Consists of Grad. Exercises and Exam. Papers, with *full* or *outline* Keys. 128 pp. 1s. MS. Books, superior, 1s. Cheap, 4d.

SARLL'S DOUBLE-ENTRY BOOK-KEEPING. Thirteenth Edition. 2s. Complete with *full* or *outline* Keys. *Practical Teacher* says:—"We *heartily* recommend it as the *best* and *cheapest* manual we have seen." For Soc. of Arts Exams., Civil Service, &c. 256 pp. MS. Books, 1s. Cheap, 4d.

SARLL AND SOC. OF ARTS—NEARLY 1,300 CERTIFICATES and Two BRONZE MEDALS. Results unsurpassed by any teacher in Great Britain.

SUPPLEMENTARY KEYS. Now Ready.

I. TO SARLL'S PRACTICAL. Containing FULLY-WORKED Keys to *all* the Exam. Papers in Practical at 1s., and to *all* the Exercises in Stages I. and II. at 4d. Two SHILLINGS.

II. TO SARLL'S DOUBLE-ENTRY. Containing FULLY-WORKED Keys to *all* the Exam. Papers in "D Entry" at 2s., and to *all* the Exercises in Stage III. at 4d. THREE SHILLINGS.

**** Specimen Copies—except Keys—at one-third off, or Teachers can have Parcels for inspection, Post Free, from A. SARLL, A.K.C. (Lecturer, People's Palace, E., Polytechnic, W., &c.), 62 Oakley Road, London, N.

Twenty Lessons by Correspondence for 10s. 6d.

London: GEORGE GILL & SONS, 13 Warwick Lane, E.C.

FOLKESTONE.

Best part; select Temperance Boarding Establishment, conducted on Christian principles. Liberal Table. Less for two sharing a room. £2, 2s. to £2, 12s. 6d. weekly. Reduced winter terms. Cycles housed. Telegrams: "Comfort," Folkestone. Stamp. Book Folkestone Central Station.

Miss WOODWARD, Haverstock House, Claremont Road.

INK.

"Duckett's Dry Inks" (Cold-water Ink-powders) produce Ink at less than a quarter of the cost of equal quality Fluid Ink, and with less trouble. Though thousands of schools have adopted them, other thousands have not yet given them a trial. That is a great pity, seeing we offer samples gratis and post free to teachers, representative men, etc., all the world over. Address always:—

DUCKETT'S DRY INKS, SHEFFIELD.

THE "WASHINGTON" Brush-Work Designs AND Crayon-Work Copies.

Designed and arranged by OWEN A. PARRACK, F.R.G.S.
Designer of the "Compromise" Outline Maps.

The Series comprises FOUR PACKETS OF DESIGNS, each containing TWELVE CARDS.
Price, per Packet, 1s. 6d.

PACKET "A."
Stage I.—Simple straight-lined and curved copies with corresponding designs.
ONE primary colour required for each copy.

PACKET "B."
Stage II.—More advanced straight-lined and curved copies and designs.
TWO primary colours required for each copy.

PACKET "C."
Stage III.—Copies and designs, beautiful in form and harmonious in colour.
THREE primary colours required for each copy.

PACKET "D."
Stage IV.—Simple geometrical copies coloured with a series of washes producing the appearance of solidity.
ONE colour (brown) required.

CHARLES & DIBLE,
Kindergarten and Educational Publishers,
LONDON: 10 Paternoster Square.
GLASGOW: 155 St. Vincent Street.

Visit the South of Ireland.

Invigorating Holiday Trips . .
By Steamer, Coach, and Rail.

THE CITY OF CORK STEAM PACKET CO.

ARE ISSUING AT
LONDON, LIVERPOOL, BRISTOL, MILFORD, SOUTHAMPTON, and PLYMOUTH,
CHEAP CIRCULAR TICKETS,

Which, in addition to a pleasant Sea Trip, afford Tourists an opportunity of visiting the "Lakes of Killarney," Bantry Bay, Glengariffe, etc.

Write for programme of specially-arranged Tours, embracing the finest Mountain, Lake, and Coast Scenery in the British Isles, and full particulars of sailings.

THE CITY OF CORK STEAM PACKET CO., Ltd., CORK.

ARMSTRONG'S DRAWING SCHOOL.

23 The Avenue, Bedford Park, London, W.

CORRESPONDENCE DEPARTMENT.
Courses for all Drawing Examinations.

Thorough guidance, and criticism of all drawings, by **Mr. C. ARMSTRONG,** Late **Head Art Master, City of London School of Art,** and Cusack Institute; **Trained Teacher,** Education Department's Certificate; **Trained Art Master,** Royal College of Art, Art Department's Certificate; an **Examiner** to the Art Department; **Author** of the well-known text-books—Cusack's "Shading," "Model," and "Freehand Ornament;"

And with ten years' experience in teaching drawing by Correspondence.

Special Courses for Scholarship Students.

STORY-BOOK READERS FOR INFANT SCHOOLS.

OUR LITTLE ONES.

Beautifully Illustrated, and printed in Bold, Clear Type.

No. 1. DOT AND ROY. With numerous Illustrations. Cloth, price 4d.
No. 2. TOM AND HIS PETS. With numerous Illustrations. Cloth, 4d.

"Teachers should certainly make a point of seeing these practical-looking little Books."—SCHOOLMASTER.

A SPECIMEN FREE TO TEACHERS.

T. NELSON AND SONS, 35 and 36 Paternoster Row, London, E.C.; Edinburgh; and New York.

Based on a word-building plan, printed in large, clear type, and illustrated in colours on every page, they are in all respects excellent.

W. B. CLIVE, UNIVERSITY TUTORIAL PRESS.

Horace: Satires. Edited by B. J. Hayes, M.A., and F. G. Plaistowe, M.A. The *Satires* are prescribed for the Intermediate Arts Examination at the London University in 1901. The clearly printed text takes up about sixty pages, while more than twice that number of pages is devoted to an introduction and notes. The subject-matter of the notes is very various. Points of grammar, philology, history, geography, and mythology are dealt with; and there are some notes on antiquities, besides frequent hints on translation. It would have been better to put some of this miscellaneous information into the form of tables or appendices. There is an index of proper names, and the introduction comprises an account of the life of Horace and his writings, especially of the Satires, allusions to philosophy, and sections on metre, prosody, and metrical licenses.

The Tutorial Latin Grammar. By B. J. Hayes, M.A., and W. F. Masom, M.A. The design of this Latin grammar, which is now in its fourth edition, is to give a sound general knowledge of Latin of the classical period without encumbering the student with a number of isolated forms and usages. The examples in the syntax are drawn to a great extent from the classics most usually read. The chief change introduced in the fourth edition is to be found in the tables of the regular conjugations; the commonest meanings of the subjunctives in principal sentences have been inserted in the paradigms, and the more important usages in dependent clauses have also been indicated by means of English conjunctions added in brackets. The book is based mainly on Neue, Dräger, Roby, and Lewis and Short. The appendix treats of grammatical terms, the Roman calendar, Roman money, prænomina, prosody, and metre, and the order of words.

Latin Composition. By A. H. Allcroft, M.A., and J. H. Haydon, M.A. This little book is intended to serve as a guide to the writing of Latin up to the point at which the student enters upon the composition of continuous prose. "The arrangement and method of the book follow, in the main, those in vogue for the teaching of English grammar," and the book is carefully adapted to the chief university elementary examinations. There is a vocabulary to the exercises, and a good grammatical index.

GRANT AND CO., LIMITED.

"The School Board Chronicle" Edition of the Code for Day Schools, 1900-1901. This edition of the Code continues to be thoroughly well prepared, and is deservedly popular. Whilst primarily intended for the use of managers and clerks, it will be found to contain everything required by all interested in the carrying on of our primary education system. Officials will find it a veritable *vade mecum*. Several new features are added this year. The index is especially good. The editor and publishers are to be congratulated upon the general excellence of the production.

HACHETTE AND CO.

The French Irregular Verbs arranged without Abbreviation for Schools and Private Students. By A. Thirion, L.ès.L.A., University of St. Andrews. This is a very useful book. It would have been still more useful if the author had given more examples of verbs having similar irregularities to those of which the irregular parts are conjugated.

E. MARLBOROUGH AND CO.

Norwegian Self-Taught. By C. A. Thimm, F.R.G.S. We fail to see how any one can teach himself Norwegian from a book which devotes five pages to the grammar of the language and contains no exercises. For the traveller who already has an acquaintance with Norwegian the conversations may have some practical value, but the student who relies wholly on this book for his knowledge of Norwegian could not, in our opinion, acquire from it a working knowledge of the language.

MOFFATT AND PAIGE.

Goldsmith's Traveller. A well-annotated edition.

T. NELSON AND SONS.

Elementary Practical Chemistry. By T. Cartwright, B.A., B.Sc. This book is intended, as the author points out, to form an introduction to the study of practical chemistry. Accordingly great care has been taken to explain the metric system, and the nature and use of the simpler apparatus used; and concise and clear instructions are given by which a young student can fit up apparatus for himself. The habit of close and exact observation—the first essential in this subject—is everywhere inculcated. In working through the various exercises given, the child obtains a clear idea of such terms as acids, bases, alkalis, salts, and of the manner in which a chemical action is expressed in equational form, together with the principles of chemical combination. Mr. Cartwright is not only a thorough master of his subject, but he is also a clever practical teacher. We cordially recommend the book to our readers.

Royal Osborne Geography Readers. Book VI., for Standards VI. and VII. The British Empire: its Geography and Commerce. (384 pp.) This book concludes the Royal Osborne Series, which is intended for use in schools adopting the alternative Geographical Course. The earlier books have won the hearty commendation of the press and the teaching profession, and it is hoped that those outstanding features which have called for such gratifying approval are equally conspicuous in the volume before us. In a series of sixty-three lessons, written in a bright, fresh manner, with considerable attention to literary style, the geographical and political features, the resources, the life, the picturesque aspects, and the commerce of our Empire have been brought home to British boys and girls, and an attempt has been made to give real information which will be of service to intending emigrants. The matter has been drawn from authoritative sources, and the latest facts (June 1900) have been included. Attention is directed to the wealth of helpful illustrations, graphic diagrams, and coloured maps.

The book is primarily a Reader, yet the geographical information it contains is thoroughly sound; and the appendix, which contains a Summary of the Geography of the Empire, renders a text-book unnecessary.

Domestic Science. The Science of Domestic Economy and Hygiene Treated Experimentally. By T. Cartwright, B.A., B.Sc. In this admirable little book, adapted to the Syllabus of Domestic Science, the elementary portions of physics and chemistry are set out in such an attractive and masterly manner that it cannot fail to be of interest, not only to those who are, either as teachers or students, directly connected with the subject, but also to many who are not concerned either with specific subjects or with codes.

As the subject will doubtless be new to many of our readers, it will probably be an advantage to give a very brief summary of its contents.

At the outset we find the measurement of length, area, volume, weight, and mass, the expansion of bodies by heat, ventilation and circulation, receive careful consideration; and this also applies to the chapters on the human body, its structure and food, together with the work of the cook in boiling, frying, and roasting. The action of yeast, and the yeast plant, followed by chapters on the composition of coal, water, soap, soda, disinfectants, etc., are in each case briefly and accurately explained. The various sections are dealt with in short chapters, each chapter containing a number of well-arranged and simple experiments which may easily be performed, at a comparatively slight cost for apparatus.

The book is obviously intended for girls. In the author's experience, they not only grasp the nature of an experiment, and are able to make accurate deductions from it quite as easily as boys, but they also as readily become adepts at manipulation.

The illustrations and printing are alike excellent.

DAVID NUTT.

Method Gaspey-Otto-Sauer. Elementary Swedish Grammar. By Henri Fort. **Elementary German Grammar.** By Dr. Emil Otto. Revised by Dr. J. Wright. **Elementary French Grammar.** By Dr. J. Wright. These three productions from the well-known Heidelberg house are exceedingly good and reliable guides to the languages covered by them. They represent the result of years of effort and experience on the part of the editors. Whilst being essentially elementary, a student who works through one of these books should be able to read easy texts with only the assistance of the dictionary. The needs of the English student are kept carefully in view, and the points of likeness and difference between the learner's mother-tongue and the language to be taught so insisted upon, that a careful student cannot fail to acquire the idiom of the language he is studying. This is particularly the case in the *French Grammar*. We heartily recommend these manuals to the attention of our readers.

RALPH, HOLLAND, AND CO.

Elementary Science. By J. H. Nancarrow. To those

JUST PUBLISHED. **JUST PUBLISHED.**

NELSON'S SUPPLEMENTARY INFANT READERS.

No. 1.

"Up to London to see the Queen."

A CONTINUOUS STORY FOR THE SIX-YEAR-OLDS.

With Four Coloured and numerous other Illustrations. 96 pages. Cloth. price 6d.

This interesting story will be sure to appeal to the little ones. It is specially written for children in Elementary Schools, and is carefully graduated in difficulty.

Infants' School teachers should make a point of seeing this book before obtaining new reading books for their scholars.

No. 2.

"Over the Hills and Far Away."

(In Preparation.)

"*" *A Specimen free to Head Teachers.*

The Royal

Kindergarten Copy Books.

The best thing yet produced for Infant Schools and Kindergarten.

Eight Books—16 pages. Price 1d. each.

1. Elements and Short Letters; i, u, n, m.
2. Short Letters joined; v, w, r.
3. Short Letters joined; o, a, c, e, s, x.
4. Figures.
5. Long Letters, complete alphabet.
6. Capital Letters, easy, joined to Small Letters.
7. Capital Letters, complete alphabet; Short Words.
8. Capital Letters, alternative forms; Short Words.

These books mark a new departure in the teaching of writing to young children. Every letter is traced throughout, but printed in a soft blue tint instead of the dotted black line commonly used. The paper is specially selected for lead-pencil work.

Write for a Specimen; post free to Teachers.

T. NELSON & SONS, 35 & 36 Paternoster Row, London, E.C.; Edinburgh; and New York.

TEACHERS' DIPLOMAS

(A.C.P., L.C.P., and F.C.P.).

N.B.—These Diplomas fully satisfy the requirements of the Teachers' Registration Bill, which will probably become law at an early date, and which states that no one shall be admitted to the Register unless he possess some *Diploma* in "Theory and Practice of Education." They are the only Diplomas in that subject which entitle the holders to wear Academical costume—cap, gown, and hood—and which confer a *title*.

Striking Success of

DIPLOMA CORRESPONDENCE COLLEGE

At the A.C.P. Examination, January, 1900.

39 D.C.C. Students sat; 37 obtained the Diploma.

Being **58** per cent. of the **entire Pass List,** and bringing our list of Successes to

165.

A.C.P. GUIDE.

Price 3d. Post free 3½d.

Send stamp for full Particulars, Prospectus, etc., to

J. W. KNIPE, Esq., Ph.D., L.C.P., F.R.S.L., Principal,

DIP. CORR. COLL., FISHPONDS, BRISTOL.

APPROVED SCHOOL BOOKS

By Dr. CORNWELL, F.R.G.S.

"We are qualified, by ample trial of the books in our own classes, to speak to their great efficiency and value. We have never known so much interest evinced, or so much progress made, as since we have employed these as our school books."—EDUCATIONAL TIMES.

A SCHOOL GEOGRAPHY. 88th Edition. **3s. 6d.**; or with 30 Maps, **5s. 6d.**

"Very superior to the common run of such books. It contains a good deal of useful matter of a more practical kind than usual, which the exercises are likely to impress on the mind more deeply than by the parrot system."—*Athenæum.*

A SCHOOL ATLAS. Consisting of Thirty Small Maps. A Companion Atlas to the Author's "School Geography." **2s. 6d.**; or **4s.** coloured.

GEOGRAPHY FOR BEGINNERS. 63th Edition. **1s.**; or with 48 pages of Questions, **1s. 4d.** Questions, **6d.**

"A very useful series of educational works, of which Dr. Cornwell is either author or editor. It ('The Geography for Beginners') is an admirable introduction. There is a vast difficulty in writing a good elementary book, and Dr. Cornwell has shown himself possessed of that rare combination of faculties which is required for the task."—*John Bull.*

SPELLING FOR BEGINNERS. A Method of Teaching Reading and Spelling at the same time. 4th Edition. **1s.**

THE SCIENCE OF ARITHMETIC. A Systematic Course of Numerical Reasoning and Computations; with very numerous Exercises. By JAMES CORNWELL, Ph.D., and Sir JOSHUA G. FITCH, LL.D. 26th Edition. **4s. 6d.**

"The best work on arithmetic which has yet appeared. It is both scientific and practical in the best and fullest sense."—*London Quarterly.*

KEY TO SCIENCE OF ARITHMETIC. With the Method of Solution to every Question. **4s. 6d.**

ALLEN & CORNWELL'S SCHOOL GRAMMAR. 64th Edition. **2s.** red leather; or **1s. 9d.** cloth.

"The excellence of the grammar published by the late Dr. Allen and Dr. Cornwell makes us almost despair of witnessing any decided improvement in this department."—*Athenæum.*

GRAMMAR FOR BEGINNERS. An Introduction to Allen and Cornwell's "School Grammar." 87th Edition. **1s.** cloth; **9d.** sewed.

"This simple Introduction is as good a book as can be used."—*Spectator.*

☞ *The Book is enlarged by a Section on Word-building, with Exercises for Young Children.*

THE YOUNG COMPOSER. Progressive Exercises in English Composition. 48th Edition. **1s. 6d.** Key, **3s.**

"The plan of the work is very superior. We are persuaded this little book will be found valuable to the intelligent instructor."—*Westminster Review.*

POETRY FOR BEGINNERS. A Selection of Short and Easy Poems for Reading and Recitation. 13th Edition. **1s.**

SCHOOL ARITHMETIC. 18th Edition. **1s. 6d.** Key, **4s. 6d.**

"Eminently practical, well stored with examples of wider range and more varied character than are usually given in such books, and, its method of treatment being thoroughly *inductive*, it is pre-eminently the book for general use."—*English Journal of Education.*

ARITHMETIC FOR BEGINNERS. Combines simplicity and fullness in teaching the First Four Rules and Elementary Fractions. 9th Edition. **1s.**

London: SIMPKIN, MARSHALL, HAMILTON, KENT, & CO., LIMITED. Edinburgh: OLIVER & BOYD.

☞ **Every Teacher should see**

The Practical Teacher's Art Monthly.

PRICE TWOPENCE.

MANY NEW FEATURES APPEAR MONTH BY MONTH.

Her Majesty's Inspectors, Principals of Training Colleges, and Thousands of Teachers are loud in their praises of

THIS EXCELLENT MONTHLY.

See Page Two of Cover for Illustrated Contents.

students who are interested in this subject, this work, adapted to the Science Syllabus for Pupil Teachers and Scholarship Students, will be found useful as an introduction to general science.

The treatment is largely experimental. The experiments suggested, numbering over two hundred, are to a great extent those recommended in the Syllabus of Elementary Physiography, and are all capable of being performed with simple apparatus. The first few are arranged in the form of question, experiment, phenomena, conclusion. These will, doubtless, be of great assistance, and enable accurate deductions to be drawn by students, especially those who are reading the subject without the aid of a teacher.

Unfortunately, in addition to several misprints and rather peculiar forms of expression (such as, "A rose or an onion can produce, when smelt, a certain sensation we call its odour"), th re are several portions which are misleading. Thus on page 56, "If a weight be raised 144 feet from the ground, and let fall, it reaches the ground in 3 seconds;" no reference is made to the resistance of the air, or that 32 is not necessarily the value of *g*. On the same page, in an example on a falling body, we have, "Attaining a velocity of 32 feet per second at the end of the first minute, 32 + 32 at the end of the next."

Again, on page 67, "Stress—the combined effect of an action and a reaction." It seems a pity that here a few numerical examples are not given.

Page 67, "The resolution of forces is the process of resolving a given force into two compound forces," or, again, "The parallelogram of forces is a graphic method of representing the effect of two forces acting upon a given point."

Momentum and energy are so very important that at least a little explanation is wanted; but the former is dismissed by the mere statement that it is the product of mass and velocity: the fundamental relations that one gives the "time action," and the other the "space action" of force, are not even referred to. In the systems of pulleys, on page 83, we find the usual first, second, and third kinds giving arrangements of utterly useless contrivances; the ordinary pulleys, which every student must have seen, and very often used, are not even mentioned.

On page 89, as an example on the screw, we have, "If the circumference be $\frac{1}{2}$ inch, and the pitch $\frac{1}{4}$ inch." As the circumference is $\frac{1}{2}$ inch, the diameter would be about $\frac{4}{25}$ inch, and as the pitch is $\frac{4}{25}$, this will form a pretty exercise for the student.

Our space will not allow more than to point out that the physics and chemistry are more satisfactory than the mechanics portion of the book. The last three chapters on astronomy will be found useful.

The book is well printed and illustrated.

SAMPSON LOW AND CO.

Memorable Paris Houses. This valuable handbook, with its sixty original illustrations, contains a large number of descriptive, critical, and anecdotal notices of many world-famous men and women. Three hundred and seventy-five noted houses have been visited by the author, and the result is here given in the form of a biographical dictionary of literary, historic, and artistic Paris. It is not a guide-book to the city and its environs, but rather a useful and pleasant companion to one's Murray or Baedeker.

WADDINGTON AND JACKMAN, LIMITED.

Cours de Français. Méthode Artistique Gautreau. Part I. By Jean B. Gautreau, B.-ès-L. The ideas of the author as to teaching French by making the pupil think in it and use it as he uses his mother tongue are sound. He has very ingeniously elaborated a course of sixty-one lessons, in which the verbs, nouns, adjectives, etc., used in the exercises are pictorially represented. As an illustration of how much can be done in this direction, M. Gautreau's book is very interesting and suggestive, and it will no doubt be useful in smoothing the way of the beginner in French; but it is evident that the method has its limitations, and that after all has been done in this direction there must remain a host of words relating to the world of reflection and of subjective sensation which cannot be illustrated. In the eighteenth lesson the names of the late and the present Presidents of the French Republic are used to illustrate some qualities and their respective opposites. All the unpleasing qualities are assigned to M. Loubet, whom the artist has represented as a particularly disreputable old man. The author may have his own private reasons for a comparison unfavourable to the present ruler of France, or the coincidence of the two names may be accidental on his part, but most people will, we think, regard it as a piece of bad taste. The illustrations are of a rather inferior character.

THE NEWEST PUBLICATIONS RECEIVED.

ALLMAN AND SON, LTD.—Excerpts from French Authors. By H. Blouet, B.A.—Preparatory Latin Lessons. By A. E. Thomas, B.A.

AMERICAN BOOK COMPANY.—Mind and Hand: Manual Training the Chief Factor in Education. By C. H. Ham.—Story of Ulysses. By M. Clarke.—Alice's Visit to the Hawaiian Islands. By Mary H. Krout.—Outline History of English and American Literature. By C. F. Johnson, Litt. Doc. 1 dollar 25 cents.

G. W. BACON AND CO., LTD.—New Drawing Charts: Soft Grey Line Series—Freehand. Part V. By F. Steeley and B. H. Trotman. Cloth, 10s. 6d.; paper, 5s. 6d.—Drawing Books. Parts I. to VI., corresponding with above. 3d. each.—Drawing Books: Common Object Series. Parts A to D. 2d. each.—New Excelsior Map of "Africa." 15s.—Poisonous Plants. 6 sheets. 1s. 6d. each. Mounted, 2s. each.

A. AND C. BLACK.—Text-Book of Zoology, treated from a Biological Standpoint. By Dr. Otto Schmeil.—A School Geography of the World. By L. W. Lyde. 2s. 6d. net.

WM. BLACKWOOD AND SONS.—Ovid: Metamorphoses (Selections). By J. H. Vince, M.A. 1s. 6d.—Blackwood's English Classics. Scott: Lady of the Lake (edited by W. E. W. Collins). 1s. 6d. Johnson: Lives of Milton and Addison (edited by J. Wight Duff). 2s. 6d.

R. BOYLE AND SON, LTD.—Upward *versus* Downward Ventilation.

CHAMBERS, LTD.—Little Stories for Little Readers. (Story Readers.) 4d.

C. J. CLAY AND SONS.—Geometrical Drawing. With Notes and Examples. Part III. By W. H. Blythe, M.A. 2s.

W. B. CLIVE (U.C.C. PRESS).—Lucian: Charon and Timon. Text and Translation. Edited by T. R. Mills, M.A.—First Stage Botany. By A. J. Ewart, Ph.D., F.L.S. 2s.—Matriculation Directory. No. xxxiii., June 1900.

A. CONSTABLE AND CO.—Tales from Tennyson. By Rev. G. C. Allen, M.A. 3s. 6d. net.

J. M. DENT AND CO.—Le Bourgeois Gentilhomme. By J. B. Poquelin Molière. With Notes by F. Spencer.—The Human Frame and the Laws of Health. By Dr. Rebmann and Dr. Seiler. 1s. net.—On the Exercise of Judgment in Literature. By W. Basil Worsfold. 1s. net.

LONGMANS, GREEN, AND CO.—Henry V. (Swan Edition). 1s.

M'DOUGALL'S EDUCATIONAL COMPANY, LTD.—Preparatory Historical Reader. 1s. 6d.

MACMILLAN AND CO., LTD.—Sense and Sensibility. By Jane Austen. Illustrated by Hugh Thomson. 2s. 6d.—At Last: A Christmas in the West Indies. By C. Kingsley. 2s. 6d.—Glaucus; or, The Wonders of the Shore. By C. Kingsley. 2s. 6d.—Snarleyyow. By Captain Marryat. 2s. 6d.

E. MARLBOROUGH AND CO.—Norwegian Self-Taught. By C. A. Thimm, F.R.G.S. 2s.

MOFFATT AND PAIGE, LTD.—Goldsmith's The Traveller. With Introduction and Notes. By T. Page. 3d.

NATIONAL UNION OF TEACHERS.—Schools and Scholars in 1900. By T. J. Macnamara, LL.D. 3d.

T. NELSON AND SONS.—New Century Library Series: Dombey and Son—Barnaby Rudge. 2s. each net.—Domestic Science. By T. Cartwright, B.A., B.Sc. 2s.—David Copperfield's Boyhood. (Supplementary Readers, No. X.) 4d.—Royal Osborne Geography Readers. Book VI. 1s. 8d.

G. NEWNES, LTD.—The Sunday Strand. July. 6d.

F. PAYOT AND CIE. (Lausanne).—Causeries françaises. June 1900. No. 9.

RALPH, HOLLAND, AND CO.—Elementary Science. By J. H. Nancarrow. 3s. 6d.

RELFE BROTHERS.—Gray's Elegy and Goldsmith's Traveller and Deserted Village. With Notes, etc. By F. Gorse, M.A. 8d.

W. RICE.—French Words and Phrases. By J. G. Anderson and F. Storr. 1s.

SAMPSON LOW AND CO., LTD.—German Prepositions at a Glance. By C. Kaiser and A. Thouaille. 1s.

SMITH, ELDER, AND CO.—Cornhill Magazine. July. 1s.

SWAN SONNENSCHEIN AND CO., LTD.—The Universal Solution for Numerical and Literal Equations. By M. A. M'Ginnis. 5s.—The Practical Sound and Sight Method of Language Teaching: French. Part I. By H. T. Mark, B.A., B.Sc., and Fr. Prellberg. 1s.

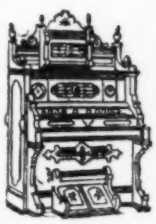
WADDINGTON AND JACKMAN, LTD.—Twenty Graduated Trios (Sol-Fa and Old Notation). 6d. each.—Commercial Correspondence and Office Routine. By R. Waddington. 6d.

BRITISH MUSEUM 26 JY 1900

THE

EDUCATIONAL MUSICAL INSTRUMENT CO.

ESTABLISHED 1881.



For Circular, Testimonials, and ANY Maker's List and designs, apply to the

MANAGER, 43 Estate Buildings, Huddersfield,

21 Argyle Crescent, Portobello, EDINBURGH; or at 20 Highbury Place, LONDON, N. (*Close to Highbury Station and Trams.*)

PIANOS, &c., FOR SCHOOL AND HOME USE.

We are offering a range of instruments **specially made** for School work, at prices within the reach of all. We have supplied some **eleven hundred** for this purpose, and can please you fully, and **save you much money.**

In Pianos and American Organs for Home use our lists indicate the best bargains in the market at the prices quoted, cash or instalments, and **many thousands of Teachers, School Managers, etc.**, have testified to the unequalled advantages we offer.

* See our 45 Guinea Piano for £21 Cash, or 36 payments of 14/2 per month.

We pay carriage, give a month's free trial, a ten years' warranty, and **exchange free of cost** if the instrument sent is not all that is desired.

N.B.—All our Pianos are fitted with a special action to the Soft Pedal that **fully subdues the tone**, and **effectually preserves** the instruments during practice.

Mr. JOHN HODDER, Clerk to the School Board, Hanley, Staffordshire, writes:—"I am instructed to order from you five more Pianos on the terms mentioned in your letter." (We have supplied fourteen Pianos to the Schools under this Board.)

Mr. J. H. YOXALL, M.P., Gen. Sec., N.U.T., writes:—"I enclose cheque in payment for Piano; the choice reflects the greatest credit on your firm. I am entirely satisfied with it in all respects, and I feel sure that a customer benefits very much by taking advantage of your experience and large connection."

Show Rooms open Daily. Call and see our Stock, or write for our List of Instruments for Home or School Use, specifying the class preferred, and you will find

WE CAN SAVE YOU MANY POUNDS.

(*Please mention this Paper.*)

THE MOST NUTRITIOUS.

EPPS'S

GRATEFUL—COMFORTING.

COCOA

BREAKFAST—SUPPER.

BORD'S PIANOS.

FOR SALE, with 25 per cent. Discount for Cash, or 14s. 6d. per month (second-hand, 10s. 6d. per month) on the Three Years' Hire System. Lists free of CHAS. STILES & Co., 40 and 42 Southampton Row, Holborn, London, W.C.—Pianos exchanged.

BECHSTEIN PIANOS.

These magnificent Pianos for hire on the Three Years' System, at advantageous prices and terms. Lists and particulars free of CHAS. STILES & Co., 40 and 42 Southampton Row, Holborn, London, W.C.

Books & Wall Sheets

FOR INFANT SCHOOLS.

JUST PUBLISHED.

A beautiful Series of Reading Books for the *INFANT SCHOOL*, With Coloured Pictures *specially designed by* ROBERT MACGREGOR, R.S.A.

ROYAL CROWN PRIMER, No. 1.

With Thirteen Coloured Pictures. 36 pages. Price 2d., paper; 3d., cloth.

ROYAL CROWN PRIMER, No. 2.

With Sixteen Coloured Pictures. 60 pages. Price 3d., paper; 4d., cloth.

Containing a large amount of *READING MATTER*, lessons on *WORD-BUILDING*, and designs for *KINDERGARTEN DRAWING* on slate and in colour.

ROYAL CROWN INFANT READER, No. 1.

ROYAL CROWN INFANT READER, No. 2.

Each with Twelve Coloured Illustrations. 88 pages. Price 6d. each. These Books contain 30 Reading Lessons in Prose and Poetry, Word Lists, and abundant easy Exercises in Word-building.

ROYAL CROWN READER, STANDARD 0.

A Combined Primer and Infant Reader. With Coloured Illustrations. 96 pages. Price 7d.

JUST PUBLISHED. In Two Divisions. Price 10s. 6d. each. Size, 41 inches by 31 inches.

ROYAL CROWN READING SHEETS.

First Division—Lessons A to J.
Second Division—Lessons M to X.

These Reading Sheets contain the Reading Pages of the Royal Crown Primer, No. 1. They are printed in Tints on strong Manilla Paper. Each Division containing 12 Sheets mounted on one Roller.

JUST PUBLISHED. Price 10s. 6d. the Set.

ROYAL CROWN WORD-BUILDING SHEETS.

A Graded Series of Word Lists, arranged according to Sound and Spelling.

Printed in Red and Black on tough Manilla Paper. Twelve Sheets (size, 42 inches by 30½ inches), mounted on one Roller to turn over.

WORD-BUILDING FOR INFANT SCHOOLS, being reduced copies of the Sheets, in book form, 12 pages. Paper cover, ½d.; stouter cover, 1d.

THE QUEEN PRIMER SERIES.

BEAUTIFULLY ILLUSTRATED.

THE QUEEN PRIMER. Containing a Complete Course of Reading, Spelling, Writing, and Tables.

Part I. Beautifully Illustrated, 32 pp., price 1d.; cloth limp, 2d.
Part II. ,, ,, 56 ,, ,, 2d. ,, 3d.

These Books are arranged on the "Step by Step" plan, in which the same words occur again and again in various combinations till the child has thoroughly mastered them.

THE QUEEN INFANT READER. Beautifully Illustrated. Containing 28 Prose Lessons, 19 Short Poetical Pieces, Drill Exercises in Vowel Sounds, Lists of Words, Script Exercises, etc. 96 pages. Cloth limp, price 5d.

The Infant Reader contains a number of simple lessons on animals, which will provide suitable matter for Object Lessons. Many of the illustrations in this book consist of Outline forms that may be used as Drawing Copies.

QUEEN PRIMER READING SHEETS.

Corresponding with the Reading Pages of Queen Primer, Part I.

SIZE OF EACH SHEET—32 inches by 40 inches.
TYPE—very large, bold, and clear.
PRICE—8s. 6d. per Set. Mounted on strong Roller.

These Wall Sheets are printed on tough parchment paper, of a kind to stand rough handling and the wear and tear of the Schoolroom. For bold and striking appearance they are unrivalled.

T. NELSON & SONS, 35 & 36 Paternoster Row, LONDON, E.C.; Parkside, EDINBURGH; & NEW YORK.

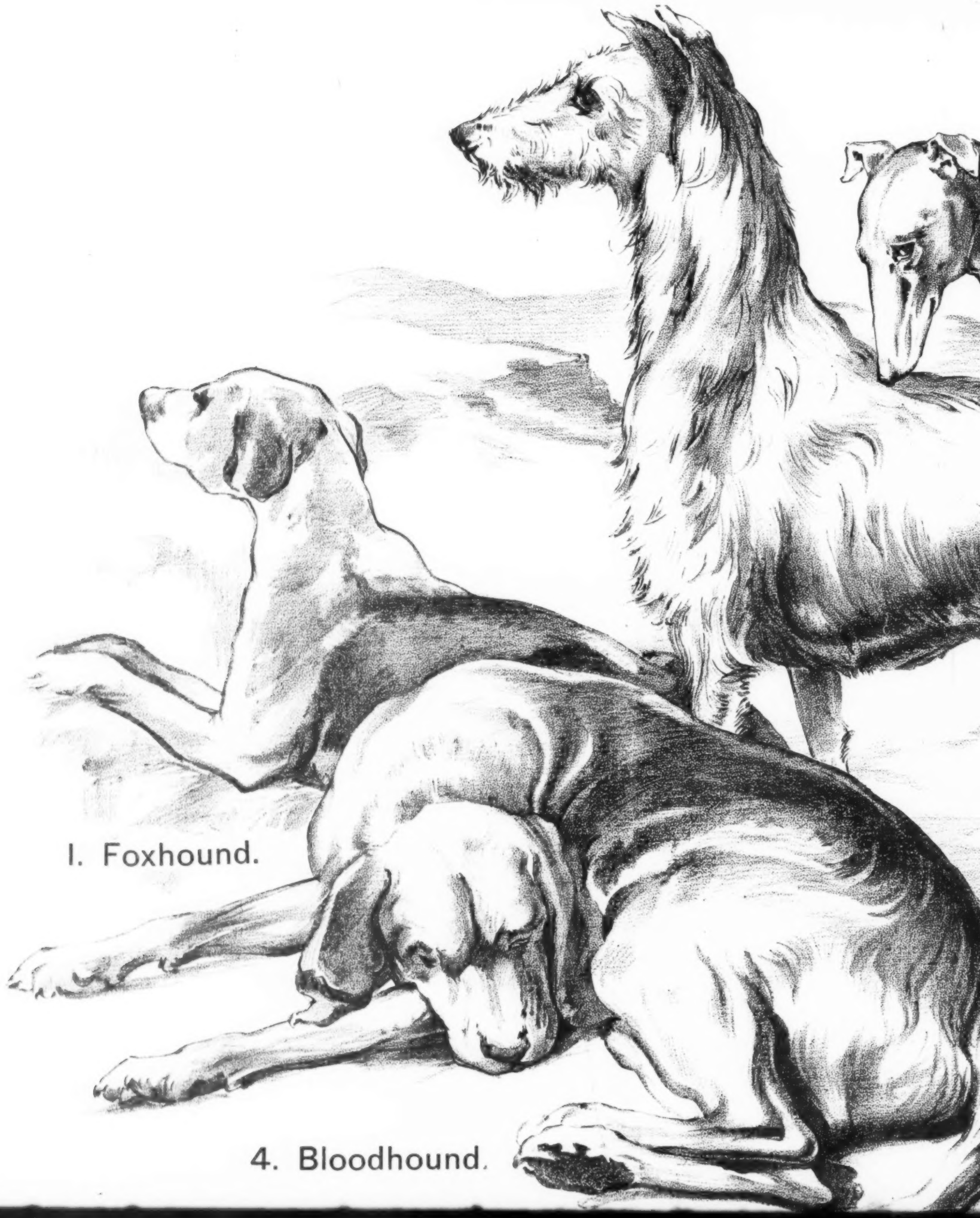
The Royal School Series.

THE BEST BOOKS, ETC., FOR PRESENT REQUIREMENTS.

LITERARY READERS. With Coloured Illustrations.	**NELSON'S ROYAL CROWN READERS.** Standard 0. Standards I. to VI. With Primers, Infant Readers, and Reading Sheets. *Supplementary Infant Reader I.*—"Up to London to See the Queen." 6d. " " " *II.*—"Over the Hills and Far Away." *[In Preparation.*
HISTORY READERS.	**NELSON'S ROYAL ST. GEORGE HISTORY READERS.** FOR *SCHEME A.* Standards I. to VII. With Text-Books. **NELSON'S ROYAL ENGLISH HISTORY READERS.** FOR *SCHEME B.* Standards II. to VII. **NELSON'S ROYAL WINDSOR HISTORY READERS.** FOR *THE ALTERNATIVE COURSE.* Standard IV., 1s. 3d.; V., 1s. 6d.; VI. and VII. in one, 1s. 8d.
GEOGRAPHY READERS.	**NELSON'S ROYAL ATLAS READERS.** Standards I. to VII., with Text-Books. **NELSON'S ROYAL OSBORNE GEOGRAPHY READERS.** FOR *THE ALTERNATIVE COURSE.* Standard IV., 1s. 3d.; V., 1s. 6d.; VI. and VII., 1s. 8d.
GEOGRAPHY WALL MAPS.	**NELSON'S ROYAL WALL ATLASES,** combined Teaching and Test Maps, printed in colours, each set mounted on one Roller. INTRODUCTORY, for Standards I. and II., 9 Sheets, 12s. 6d. No. 1. THE BRITISH ISLES, 12 Maps, 12s. 6d. No. 2. EUROPE, 12 Maps, 17s. 6d. No. 3. THE BRITISH EMPIRE, 12 Maps, 17s. 6d. No. 4. BIBLE LANDS, 7 Maps, 15s. **NELSON'S ROYAL WALL MAPS,** threefold in purpose, Physical, Political, and Test Map in one. Seven in the Series, 15s. each.
SUPPLEMENTARY READERS.	**NELSON'S ROYAL STANDARD AUTHORS.** Four Volumes. 1s. 6d. each. **FIRST LESSONS IN ENGLISH GOVERNMENT.** 1s. 6d. **GREEK AND ROMAN HEROES.** From Plutarch's Lives. 2s. **BALLANTYNE'S "CORAL ISLAND."** School Edition. 1s. 6d. **GIRLS AT HOME.** A Reader in Domestic Economy. 1s. 6d. **NELSON'S SUPPLEMENTARY READERS.** A Specially Edited and Specially Cheap Series. Now publishing—Ten Volumes Ready. 3d. or 4d. per Volume.
ELEMENTARY SCIENCE or OBJECT LESSONS.	**NELSON'S ROYAL SCIENCE READERS.** Standard I., 9d.; II., 10d.; III., 1s. **NELSON'S ROYAL SCIENCE READERS WALL SHEETS.** **NELSON'S ROYAL PORTFOLIO OF PICTURES AND DIAGRAMS.** **NELSON'S ROYAL SCIENCE DIAGRAMS.** 2s. 6d. each. **ELEMENTARY SCIENCE IN OBJECT LESSONS.** A Series of Handbooks for Teachers. Standards II. to VII. 1s. 6d. and 2s. each.
WRITING COPY BOOKS.	**NELSON'S ROYAL COPY BOOKS.** 24 Numbers. 2d. each. **NELSON'S ROYAL STAR COPY BOOKS.** 13 Numbers. 2d. each. **NELSON'S ROYAL UPRIGHT COPY BOOKS.** 10 Numbers. 2d. each. **NELSON'S KINDERGARTEN COPY BOOKS.** 8 Numbers. 1d. each. **NELSON'S ROYAL PENNY COPY BOOKS.** 12 Numbers. 1d. each.

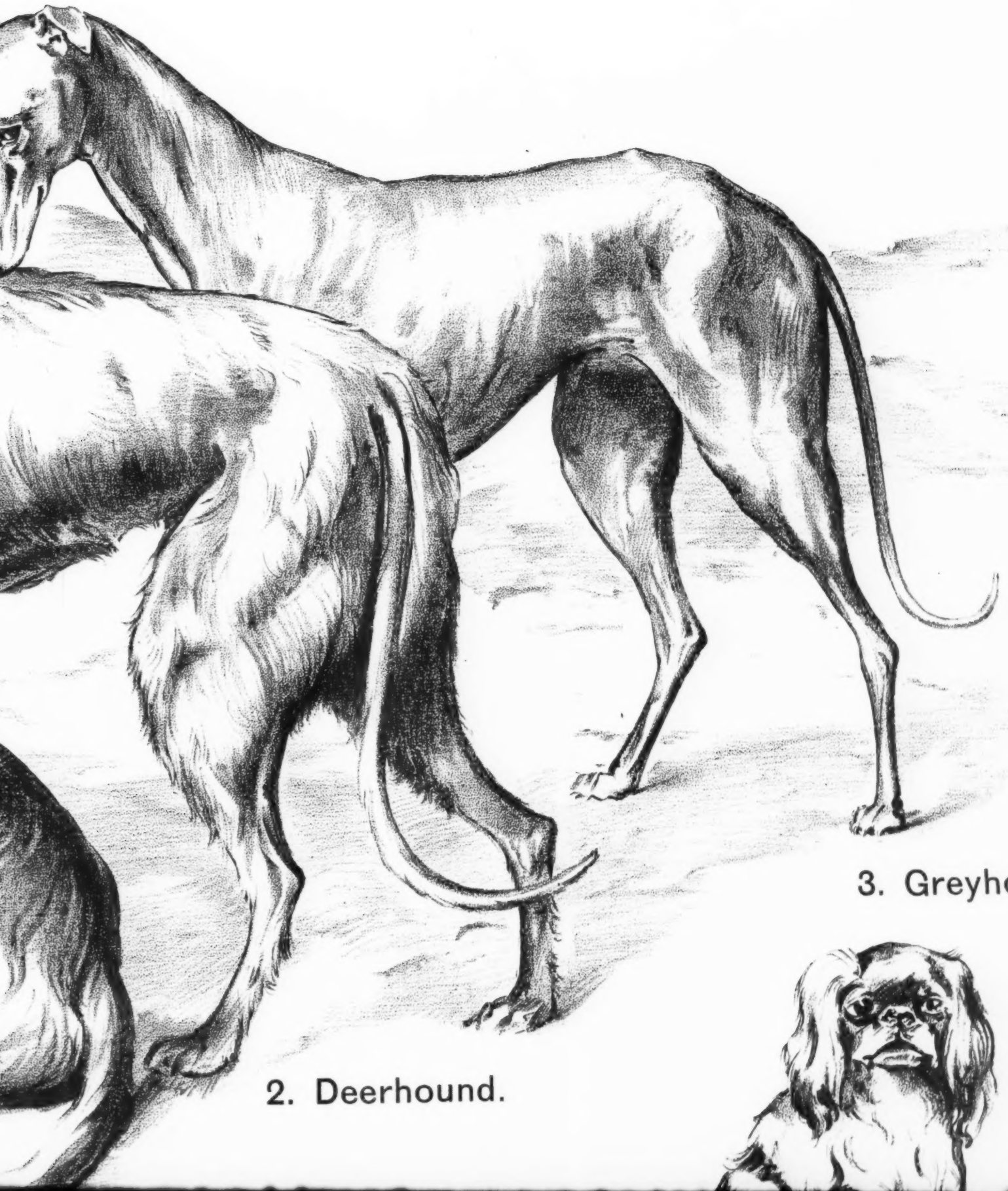
*** Full Particulars in Nelson's School Catalogue, post free on application.*

T. NELSON & SONS, 35 & 36 Paternoster Row, London, E.C.; Parkside, Edinburgh; and New York.



1. Foxhound.

4. Bloodhound.



2. Deerhound.

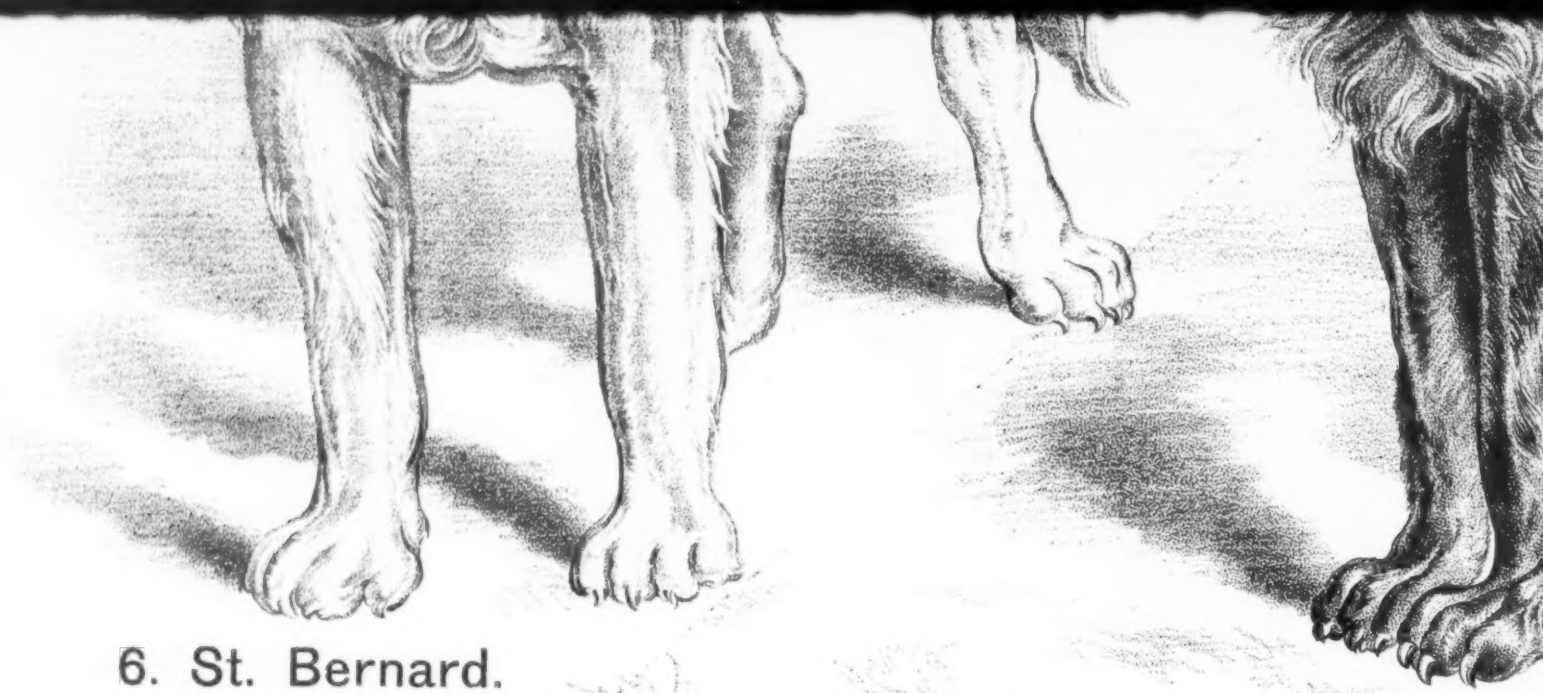
3. Greyhound.

4. Bloodhound.

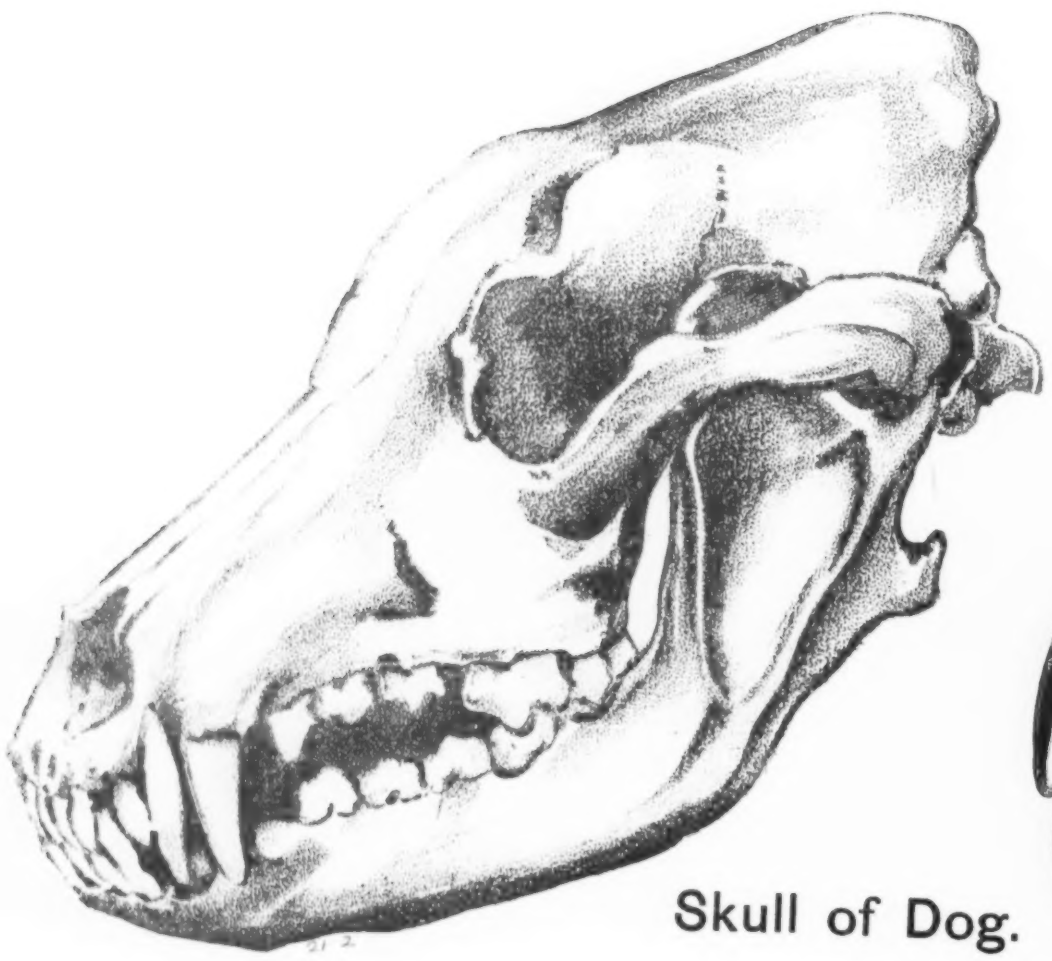
3. Greyhound.

2. Deerhound.

5. Blenheim Spaniel.



6. St. Bernard.

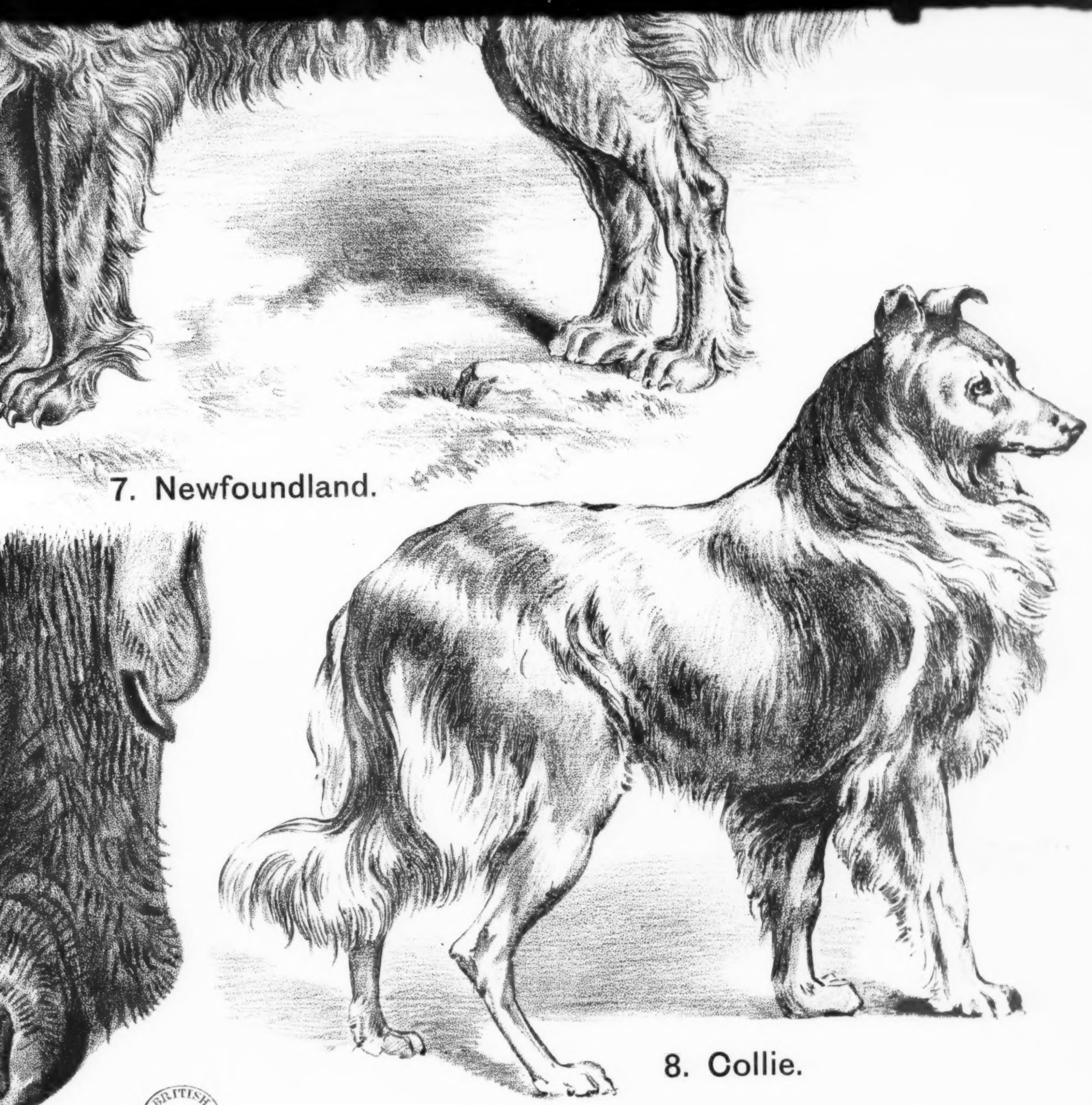


Skull of Dog.

Paw of

THE

Published at the Office of THE PRACTICAL TE



7. Newfoundland.

8. Collie.

BRITISH
26 JY 1900
MUSEUM

Paw of Dog.

E DOG.

ICAL TEACHER, 33 Paternoster Row, London, E.C.

The Royal School Series.

New Number of Nelson's Royal Wall Atlases.

BIBLE LANDS.

Being No. IV. of Nelson's Royal Wall Atlases.

Seven Sheets, 41½ in. by 31 in. Full Coloured, Mounted on One Roller, price 15s.

This Atlas contains on a large scale all the Maps required to illustrate Old and New Testament History. Such aids to teaching the Geography required for an understanding of the Bible Lesson have not hitherto been available.

List of Maps.

1. The Ancient World. 2. Canaan. 3. Dominions of David and Solomon. 4. Palestine. 5. Galilee. 6. St. Paul's Journeys. 7. Persian and Roman Empires.

ROYAL WALL ATLASES.

Already Published.

Introductory. For Standards I. and II. 9 Sheets. Price 12s. 6d.
1. The British Isles. 12 Maps. Price 12s. 6d.
2. Europe. 12 Maps. Price 17s. 6d.
3. The British Empire. 12 Maps. 17s. 6d.
4. Bible Lands. 7 Maps. Price 15s.

Just Issued in Nelson's Royal Portfolio of Pictures and Diagrams.

ANIMAL PHYSIOLOGY.

Printed in Full Colours, on dark background, on strong Manilla Paper. Size, 34 in. by 30½ in. Mounted on Roller to turn over. Price 20s. the Set; or separately, unmounted, 2s. 6d. each.

List of Sheets.

1. The Skeleton. 2. The Muscles. 3. The Teeth. 4. The Organs of Digestion. 5. The Circulation of the Blood. 6. The Organs of Respiration. 7. The Kidneys; The Skin. 8. The Nervous System. 9. The Eye. 10. The Ear.

Just Issued in

NELSON'S ROYAL PORTFOLIO
(GEOGRAPHICAL SERIES).

PICTURES OF THE EMPIRE.

A Series of Beautiful Pictures of Striking Scenes in the British Empire.

PRINTED IN COLOURS.

Size of Sheet, 28 inches by 21 inches.

Now Ready.

The Houses of Parliament, Westminster.
The Taj Mahal, Agra.
Valetta Harbour, Malta.
Gibraltar, from near Algeciras.
Jamaica—Sugar Plantation.
The Suez Canal.
Diamond Mines, Kimberley.

**** Other Subjects in hand, will follow shortly.*

These Illustrations are true pictures, the originals painted by well-known Water-Colour Artists. They are specially suited for School Decoration, and at the same time may be used as a basis for vivid Geographical instruction.

Nothing better for Geographical Object Lessons could be provided.

PRICES.

Unmounted, **1s.** each net.
With Metal Mounts at top and bottom, **1s. 6d.** net.
Mounted on thick Cards, eyeletted and varnished, **2s.** net.
Mounted on Linen, with Wooden Rollers, and varnished, **2s. 6d.** net.

**** Full Prospectus post free on application.*

JUST PUBLISHED.

DOMESTIC SCIENCE.

The Science of Domestic Economy and Hygiene Treated Experimentally.

By THOMAS CARTWRIGHT, B.A., B.Sc.,
Author of "Elementary Practical Chemistry," "'Section One' Physiography," etc.

With numerous Illustrations. 215 pages. Cloth, 2s.

**** This volume fully covers the subject of Domestic Science as set out in Specific Subject XIV. of the Education Department's Code.*

ELEMENTARY PRACTICAL CHEMISTRY

For Schools of Science.

By THOMAS CARTWRIGHT, B.A., B.Sc.,
Author of "'Section One' Physiography."

With numerous Illustrations. Cloth, price 2s.

Evening Continuation Schools.

SESSION 1900-1901.

In Preparation and Nearly Ready.

T. NELSON & SONS'

EVENING CONTINUATION SCHOOL CATALOGUE.

It will contain a list of Suitable Text-Books arranged in Groups, according to the Department's Syllabus of Concise Schemes.

**** Responsible Teachers should make a point of seeing this Catalogue. A Copy will be sent post free on application.*

NOW READY.

Royal Osborne Geography Readers,

Book VI.

THE BRITISH EMPIRE: Its Geography and Commerce. (Standards VI. & VII.)

(Being the Alternative Geographical Course for Schools which take other Class Subjects in the Lowest Three Standards.)

Beautifully Illustrated, and containing Coloured Maps, Notes and Meanings, Summary of Geography, etc.
Cloth boards, price 1s. 8d.

Already published in this Series.

Book IV. (for Standard IV.). **SEA AND LAND.** 253 pages, cloth boards. Price 1s. 3d.

Book V. (for Standard V.). **PHYSICAL AND POLITICAL GEOGRAPHY OF THE BRITISH ISLES.** 292 pages, cloth boards. Price 1s. 6d.

***** The books of this Series are vigorous and picturesque in style, and thoroughly adapted to the scholars for whom intended. Wherever possible, Geography and History have gone hand in hand. Spelling Lists, Notes and Meanings, and a Summary of the Geography are contained in the Appendix to each book.

T. NELSON & SONS, 35 & 36 Paternoster Row, London, E.C.; Parkside, Edinburgh; and New York.

NELSON'S TEXT-BOOKS FOR STUDENTS AND TEACHERS.

BOARD OF EDUCATION, WHITEHALL.

SCHOLARSHIP EXAMINATION, 1901,

AND

CERTIFICATE EXAMINATION, 1900-1901.

The Board of Education, in the Syllabuses for SCHOLARSHIP and CERTIFICATE EXAMINATIONS just issued for 1901, state that

"NO SET BOOKS IN FRENCH" WILL BE PRESCRIBED.

Students preparing for these Examinations, as well as for London Matriculation, cannot do better than carefully study the volumes in the series below.

LE ROI DES MONTAGNES (Edmond About). With Introduction, Notes, Exercises, and Vocabulary. By George Collar, B.A., B.Sc. Price 2s.

UN PHILOSOPHE SOUS LES TOITS (Emile Souvestre). A Juxtalinear Translation. With Hints to Students, Explanatory Notes, etc. By A. D. J. Barriball, B.A., Lecturer in French, Wesleyan Training College, Westminster. Price 2s.

VOYAGE AUTOUR DE MA CHAMBRE (Xavier de Maistre). With Introduction, Notes, and Exercises. By George Collar, B.A., B.Sc., Head-master of Stockwell Pupil Teacher Centre. Price 1s. net.

METHODE NATURELLE POUR APPRENDRE LE FRANÇAIS. Fondée sur l'Enseignement Intuitif. By George Hogben, M.A. Illustrated. 332 pages. Post 8vo. Cloth. Price 3s. 6d.

A NEW ELEMENTARY FRENCH COURSE. Specially designed for Young Students, Pupil Teachers, and Queen's Scholarship Candidates. By F. E. Darqué. Fourth Edition. Price 2s.

XAVIER DE MAISTRE. LA JEUNE SIBERIENNE. A Juxtalinear Translation, with Notes by F. E. Darqué. Fourth Edition. Price 2s.

PLINY'S LETTERS, I. to XII. With Introduction, Text, Notes, Translation, Vocabulary, and Examination Papers. Edited by W. J. Weston, B.A. 1s. net.

ELEMENTARY PRACTICAL CHEMISTRY. For Schools of Science. By Thomas Cartwright, B.A., B.Sc., author of "'Section One' Physiography," etc. With numerous Illustrations. Cloth. Price 2s.

DOMESTIC SCIENCE: The Science of Domestic Economy and Hygiene treated Experimentally. By Thomas Cartwright, B.A., B.Sc. Price 2s.

AN ELEMENTARY COURSE IN PRACTICAL PHYSICS. By F. Castle, M.I.M.E. With many Illustrations and Diagrams. 226 pages. Crown 8vo, cloth extra. Price 2s.

TIMBER AND TOOLS. A Text-book for Manual Training Classes, to accompany "Woodwork for Schools." By Jerome Wallace, F.E.I.S. Numerous Illustrations and Diagrams. Cloth. Price 3s. 6d.

BROOK'S DESCRIPTIVE GEOGRAPHY. By Samuel Brook, Head-master, Senior Practising Schools, Westminster Training College. Thoroughly Revised and Improved. New Matter—New Maps—New Type. With Diagrams and Illustrations. New Edition. 637 pages. Cloth. Price 3s. 6d.

A new edition of this well-known Geography having been called for, the opportunity has been taken to have the book revised and brought up to date by alteration, rearrangement, or addition of matter where necessary, and by preparing new maps. New type of great clearness has been used throughout.

The top Student in the Queen's Scholarship Exams., 1898 and 1899, used Brook's Geography.

DOMESTIC ECONOMY FOR SCHOOLMISTRESSES. Revised and adapted by J. C. Horobin, M.A., Principal, Cavendish College, Cambridge, to meet latest requirements of Pupil Teachers', Scholarship, Certificate, Elementary Hygiene, and Cookery Examinations. Profusely Illustrated. New Edition. 463 pages. Price 2s. 6d.

MENTAL SCIENCE, LOGIC, AND ETHICS FOR TEACHERS. By Thomas Cartwright, B.A., B.Sc. (Lond.). New and Enlarged Edition. 203 pages. Price 2s. 6d.

"SECTION ONE" PHYSIOGRAPHY. By Thomas Cartwright, B.A., B.Sc. (Lond.); Head-master, Finchley Science School; Lecturer in Chemistry to the Middlesex County Council. Illustrated. 208 pages. Price 2s.

GREGORY'S ELEMENTARY PHYSIOGRAPHY. By Professor Richard A. Gregory, Oxford University Extension Lecturer; Fellow of the Royal Astronomical Society, etc., etc. With an Appendix by Thomas Cartwright. 2s. 6d.

GREGORY'S ADVANCED PHYSIOGRAPHY. By Professor R. A. Gregory and J. C. Christie, Lecturer in Geology at the Glasgow and West of Scotland Technical College. A New and Revised Edition, with Supplementary Matter by Thomas Cartwright. Price 4s.

PHYSICAL AND ASTRONOMICAL GEOGRAPHY. By Professor R. A. Gregory. Specially designed for Pupil Teachers and Scholarship and Certificate Candidates. With Original Illustrations. Crown 8vo. Cloth extra. 3s. 6d.

PUPIL TEACHERS' AND SCHOLARSHIP SCHOOL MANAGEMENT. By A. T. Flux. Revised. Price 1s. 6d.

"Top" Students of Scholarship in England and Scotland have used this book.

THE "METHODIC" SCHOLARSHIP MEMORY MAPS. Easy to Memorize and Easy to Reproduce. By A. T. Flux, Head-master, Pupil-Teachers' School, Belvedere. Price 1s.

THE PRACTICAL TEACHER'S COPY BOOK. By A. T. Flux. 1s.

Special Features:—Natural slope. Simple formation of letters combined with clearness and beauty of form. Easily and rapidly produced.

THOMAS NELSON AND SONS,

35 and 36 Paternoster Row, London, E.C.; Parkside, Edinburgh; and New York.

BRITISH MUSEUM
26 JY 1900

COUPON
PRACTICAL TEACHER
August 1900.

Printed and Published by Thomas Nelson & Sons, Proprietors, at the Office of "The Practical Teacher," 35 & 36 Paternoster Row, London, E.C.